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# ELECTRICITY,

O R

## ETHEREAL FIRE,

CONSIDERED:

1st. NATURALLY, AS THE  
AGENT OF ANIMAL AND VE-  
GETABLE LIFE:

2d. ASTRONOMICALLY, OR

AS THE AGENT OF GRAVITA-  
TION AND MOTION:

3d. MEDICALLY, OR ITS AR-  
TIFICIAL USE IN DISEASES.

COMPREHENDING BOTH THE

### THEORY AND PRACTICE

O F

## MEDICAL ELECTRICITY;

AND DEMONSTRATED TO BE AN INFALLIBLE  
CURE OF FEVER, INFLAMMATION,  
AND MANY OTHER DISEASES:

CONSTITUTING

### THE BEST FAMILY PHYSICIAN

EVER EXTANT.

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By T. GALE, M. D. 1377

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PUBLISHED ACCORDING TO ACT OF CONGRESS.

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## P R E F A C E.

*KIND READER,*

THE most of modern Authors are obliged to apologize for attempting the improvement of subjects so frequently, and very often so successfully treated of by their predecessors: but as the principal part of the subsequent pages are occupied on subjects entirely new, I have no apology of that description to make. I have only to desire my reader to look rather at the matter, than at the manner of my treating the various subjects which I have taken under consideration. etheral fire, or electricity, is a subject both novel and occult. Authors who have written on the subject, if we may suppose they ever entered on the margin thereof, have remained at an infinite distance from the knowledge of its properties, nature and agency. A few of them, it is true, have discovered electricity to be a valuable mean of health; and have recommended it to mankind: But the leading principles, even to the acquirement of its medical powers, have forever passed their observation.

In the following work I have endeavoured to make soundings, to go to the bottom of this intricate subject, to unlock the cabinet, and present my readers with some of the phenomena of nature. My first design, however, was to investigate medical electricity only; but this latent, mysterious and powerful agent, pervades all creation, is capable of assuming such a variety of appearances, and of producing such a variety of effects, both in the animate and inanimate creation, I could not pass the importance of its agency in creation, in silence. I have first treated of its natural agency in supporting animal and vegetable life—have described some of its different states, and how the health of animals is affected thereby. I have then further considered its various properties and effects, its various modifications and states, and have applied them to the celestial bodies, and shown in the clearest manner, that the whole phe-

nomena of gravitation and motion are founded in this ethereal fire —have applied it in particular to the rotations and motions in our own globe, and have demonstrated, that her diurnal rotation upon her axis, her annual rotation round the sun, her ecliptic motion in her orbit, the inequality of her diurnal rotation, and the acceleration of her motion when the sun is in the southern hemisphere, are altogether performed by the powerful agency of electricity, or ethereal fire. I have shown that the polar effusions preserve the torrid zone from destruction by tornadoes. And finally, that all motion in earth, air and water, is to be ascribed to the existing agency of ethereal fire. I have shown the probability, if not the certainty, that the sun of our system is an infinite, or an incalculable condensation of ethereal fire, and being unexpanded, the degrees of his cold are in proportion to the degrees of his densation; that his inaccessible lustre is the consequence of infinite densation of electric fire; that all animals and vegetables participate of a degree of the same element; and that the presence of the sun, or the action of his light, induces different states in that diminished degree of ethereal fire which pervades his whole system; and by enduring these different states, all his system is put into their several rotations and motions; that the action of his light reduces that elasticity, or unyielding inflexible property of ethereal fire, or electricity, in certain degrees of its density, whereby not only the system is put in motion, but the vegetable life is promoted; and that an excessive reduction of the elasticity of elementary fire, is unfavourable to the health of animal life, as the lungs are less expanded, and the circulations impeded. I have then demonstrated the analogy existing between the natural and spiritual world; that the natural world is framed after the pattern of the spiritual; that as the natural sun governs his whole inanimate system by the glory of his presence, he is a striking emblem of the sun of the spiritual world; and, that as all animals and vegetables participate of the same element of the natural sun, his presence is the prolific power of all animals and vegetables, their life and animation; so also is the spiritual sun the quickening, sustaining, animating principle of life to all moral intelligences who participate the nature of the spiritual sun. But as all moral intelligences neither

have, nor desire to have, nor will believe there is to be had, the soul-animating presence of a spiritual sun, the analogy between the natural and spiritual world is broken, and I open the volume of nature, if he will believe nothing else, to preach to him the doctrine of his depravity.

Having by this time taken an extensive, but concise view of the wonderful agency that Heaven hath assigned to the single element of fire, I have suggested the propriety of improving it artfully, as an excellent antidote of diseases and preservative of health. I have suggested, that, considering the Author of nature has endowed this element with such a variety of exquisite powers in the state of nature, it is at least prudent to attempt some artificial improvement of it, and not to be tampering altogether with the mere fragments of nature.

But, for myself, a probability is superceded by actual experiments continued almost twenty years; it is for the sake of those who have had little or no experience in medical electricity, that I have suggested probabilities. A certain conviction of its inestimable worth, hath imposed it a duty on my conscience to publish my improvements and discoveries to mankind.

This is the part of the subject that affords me pleasure, and that in which mankind are deeply interested. The other parts afford speculation to philosophers and astronomers; but this is that in which the lives, healths and interests of all ranks, ages and descriptions of people are concerned.

It is to be regretted, that electricity hath ever been used as a medicine, until its nature and effects were better understood. Its use hath been greatly perverted, and the first expectations of many greatly frustrated and disappointed. Want of a due degree of knowledge to administer it, hath generally rendered abortive every intention of cure by the application. From which hath arisen the cause of electricity having remained in such low repute in the minds of many people. Physicians also take an undue advantage of this circumstance, and seem determined that it is either not of any use, or if it is, that mankind shall never know it. They will not give themselves the trouble of inquiring into the subject; but they are very lavish of stigmas and calumnies on those who will do it. Some of them will hear attentively, arguments,

on the subject of medical electricity, which they neither will attempt to refute in presence of one who understands the doctrine, but will lose no opportunity of prejudicing the minds of their neighbours against it, especially as far as their practice extends. They make me think of those who made shrines to the goddess Diana of Ephesus, and got their living thereby: they cry out, great is the *materia medica*! This electrician is like to do us much damage! Who knows not that all the world (excepting a few insignificant quacks) have bowed down to the great *materia medica*! Yes, bowed, many millions, quite into the dust. No matter for that, the shrine-makers got a good living by it.

But I have, kind reader, stood aloof to all their insolence, have gone abreast to all their opposition, and have completed a subject, which for its intricacy and importance outvies all undertakings of the kind ever extant. I have unclouded the glory of this inestimable medicine, have extricated it from all the abuses it hath suffered from those who have neither known its nature nor its effects; I have presented it to universal observation, full-orbed with all its medical powers. I have long since despaired of the aid of physicians to promulgate medical electricity, yea, been convinced that many of them were, to a degree of malice, opposed to it. The consequence hath been, that I have treated the subject in a very plain, familiar manner; that any man of common ingenuity may perfectly understand the business—may have a clear knowledge of the effect of the electric shocks—of the insolation or filling the body with fire—in what manner the shocks must be directed, and repeated, in every particular disease—what care must be taken of the patient; and what corroborating means in many cases must be applied with electricity. I have demonstrated that the electric shocks produce that very singular effect which is necessary to remove fever and inflammation; that if it is used in the first stages of a fever, there can be no failure of cure; it must prove an infallible remedy. I have, in the course of the work, considered the salutary effects of the electric shocks, in a great number of diseases—have shown that the fluids conduct the electric fire, and in what manner the fluids and solids are affected by the shock;—that in a prudent use of it, every effect produced, in

fluids or solids, is salutary, and tends to prevent or to remove diseases. I have clearly demonstrated, that a proper use of electric fire is capable of preventing all general diseases in the human body; and that no known general disease can originate in the human body without a miracle. These assertions will, undoubtedly, appear too good to be true, with those who have observed many impositions offered to the public in this line; but let my reader reflect for a moment, that the medicine I am recommending is infinitely greater than any thing else in the natural world; that it is the very soul of the universe; that it is the accelerating, animating and all-sustaining principle both of the animate and inanimate creation; that the Author of nature hath endowed it with many exquisite powers, and that, in the artificial improvement of them, it transcends all mineral and vegetable productions of medical specifics, as the soul of the vegetable kingdom transcends the mere fragments thereof. Moreover, so far as experience hath gone, no person under the use of electricity hath ever been arrested by any fever, pleurisy, peripneumony or inflammation of the lungs, rheumatism or any kind of inflammatory disease—for it is absolutely anti-febrile to all intents and purposes, and generally anti-spasmodic: it expands every vessel, more or less, according to the strength of the shock; it imparts elastic springs to the vessels, and accelerates the circulation, and ferments the fluids universally; it promotes every description of the secretions; it purifies the blood and cleanses the system of humours; consequently no person who uses the electric shocks frequently, and with that degree of prudence which I have taught in the body of the work, ever has, or ever can be troubled with dropsies, ulcers, cancers, quinsies, king's-evil, St. Anthony's fire, biles, tumefactions, polypus, or extravasitation of the circulations. Had I known the effects of an electric shock on the solids and fluids, it would have been easy, without an experiment, to determine that it was a remedy of every disease I have mentioned, or that it was easy forever to prevent them. Some will reply, according to this plan, man will live forever. I mean no such thing; but I mean thus much, that there is no doubt but that the greater part of mankind will spin out their years to great length, and escape much pain, sickness and



distress—will escape those rheumatics, ulcers, &c. which destroy the nerves and joints, and leave them decrepid for life ; this may certainly be added to the catalogue of blessings, with all the aforementioned. If this is not true, how came it to pass that the celebrated John Wesley, who, when about middle aged, was in a pulmonary consumption of the lungs, from taking too large quantities of the bark in substance, as he says; notwithstanding all this and the manner of his life, which was sedentary, he survived to 98 years. His brother Charles, I believe, is yet living, and must be more than 100 years of age. These men made frequent use of electricity, and recommend it in the most pathetic forms. As for myself, I have used it very freely, especially in the warm seasons, for nearly twenty years, and I have had no kind of disease during this time, not even pained for a minute, excepting by some trifling wound, and once for a few hours, by neglecting the use of physic ; my constitution is much haler, and I am in much better health than when I began the use of it ; for my health was greatly impaired by a bilious habit and frequent attacks of the fever, continual jaundice, and pain in my left side, all which are totally eradicated and left me in perfect health ; and this has been effected by the electric shocks only, after having spent much on several physicians, and in the use of other medicine, to little purpose.

It must be granted, however, that there are several diseases which, when they are seated, and of long continuance, cannot be eradicated by electricity ; but there is scarcely one can be named which it will not prevent, if properly used for the purpose. Hence I have suggested a method to establish a conviction of this important truth in the minds of people generally, as fast as time and observation will admit of it ; which may be done thus :—Let every head of a family, intending to give it a fair experiment for several years, (for it must take some time to establish so weighty a matter) keep an exact account of the diseases that occur in the family, if any there be, and of what description—notice any prevailing disease that may be about them, in their neighbourhood, city or village—notice its mortal sway over those who use not this preventative mean—observe minutely on whom fevers, drops,



sies and diseases in general prevail ; compare their frequent attacks by diseases, their great expences for medical attendance, loss of time on beds of languishment, to say nothing of the excruciating pains, which might make death a welcome messenger to them ; after observing these things a few years, make a fair statement of facts, and publish your observations to the world. It is worth a little time and trouble to convince people of a truth of so much importance to themselves—the benevolent mind cannot hesitate for a moment, at doing this laudable service for his fellow-creatures—remember, the mercury of man is so fixed, that he is blessed in blessing, or cursed in cursing. We support ourselves best, when we most aid, or are most subservient to the happiness of mankind.

Man, like the generous vine, supported, lives ;  
The strength he gains, is from th' embrace he gives.

POPE'S ESSAY ON MAN.

As it would be of no importance to any man, to be informed of a valuable medicine which could not be obtained ; I have, in the latter part of the work, described a very cheap construction of the electrical machinery, which any man may build for himself, at two or three dollars cost and a little labour. This construction, which I have invented, will answer a much better medical purpose than those imported from Europe, although they cost several guineas. I have described the cheapest, that any man may be able to furnish himself with them. They may be rendered ornamental, by those who will be at the cost thereof.

I have described the use of lightning-rods, and the manner of erecting them upon buildings, the most effectually to guard them from damage ; and pointed out the most secure part of a room, to remain in in time of lightning. Have cautioned people against taking shelter under trees in a thunder-shower, by which means, as well as by taking improper parts of a room to sit in, many lives are lost, which might otherwise have been preserved. Finally, I have been careful to communicate every thing in my power, on the subject of electricity, that might be useful to mankind. I have had a few motives to induce me to treat of electricity astronomi-

cally, or as being that element in which is founded all the motions and rotations in the heavenly bodies ; and these have been, partly to spare philosophers and academicians any further fruitless attempts to account for them on principles altogether unconnected with truth : partly to lead us to admire that wonderful harmony, order and design which are so apparent in creation, and greatly enlarged to our view by the discovery ; and refute many objections of Atheists to the existence of Infinite Intelligence and Providence ; and partly to suggest to my reader the reasonableness of endeavouring to improve this wonderful agent in nature, for medical purposes.

To be brief, I have, in all respects, endeavoured to render this work a rich compensation to the purchaser, a lasting blessing to mankind. As a testimony of my good will to my fellow-creatures, let me urge them to an immediate use of the means of health herein recommended—that they turn a deaf ear to the ignorant or designing, who will use their policy to dissuade them from any attention to it. Physicians, who constantly will compare electricity with their specifics, and not being acquainted with any thing that approaches so nigh to an universal medicine, have got a habit of ridiculing the subject of medical electricity, of which they are totally ignorant, merely on account that it claims a notable preference to any other medicine ; and, as it is possible that some of them are not honest, their opposition may proceed from a motive justly execrable. Be then on your guard, reader ; let them not laugh you out of your money : your money, did I say ? it is a trifle ; let them not laugh you out of your lives and healths. In the sincerity of my soul, and for the welfare of mankind, connected with my own sustenance, I have performed these labours. Long practice, much observation and attention to the subject of medical electricity, hath confirmed to me the certainty of what I have advanced, on the power that it hath over diseases ; and I can, without being chargeable with intentional injustice, add, the Judge of secrets knoweth that I lie not.

We will now introduce an entreaty expressed by that truly great scholar, christian and philanthropist, the Rev. Dr. John Wesley, before named. *Vide Beauties of Wesley, p. 152 ;*

where, writing on medical electricity, he expresses himself thus: "It were greatly to be wished that the gentlemen of the faculty would strictly examine the nature, properties and effects of this sovereign remedy, for such it unquestionably is, particularly in nervous cases, even in those cases which the *materia medica* will in no wise reach. But it is not to be expected; they must not disoblige their good friends, the apothecaries. Neither can it consist with their own interest to make (although not every man) so many men, their own physicians, which would be the unavoidable consequence, if a regular system of practical rules was formed from a process of experiments, whereby a sensible man might judge in what cases it would cure, &c. &c."

My reader hath now in his hands a complete investigation of the nature, properties and effects of this sovereign remedy, together with a consummate system of practical rules, formed from an expensive, arduous process of experiments, so much wished for by this good and great man, who testifies in another place, that it far excels all the medicine he ever knew. I must now leave you to ponder on these things, while I express my wishes, that none would be like the fool, who, "having a price put into his hand, hath no heart to improve it."

THE AUTHOR.



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# ANIMAL AND VEGETABLE ELECTRICITY.

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## CHAPTER I.

*Electricity the principal agent of animal life—of the vegetable life and growth—its action a direct stimulus—deficiency of its density or elasticity subversive of animal health, and induces diseases of debility—intense and long continued heat reduces its density or elasticity.—Electricity or ethereal fire further considered, philosophically and astronomically—all the phenomena of gravitation and motion founded in elementary fire—its qualities and agency bears analogy to the spiritual world.*

THE electrical effluvia is far more subtle than air, is diffused through all space, surrounds the earth, and pervades every part of it; and such is the extreme fineness, velocity and expansiveness of this active principle, that all other matter seems to be only the body, and this the soul of the universe. This element exists in all places and in all bodies; and its action is sufficient not only to be (under the First Cause) the secondary cause of motion, but to produce and support life throughout all na-

ture, as well in animals as vegetables. Now as the heat of every animal is the engine which circulates the blood through the whole body; so the sun, as the heat of the world, circulates or rarifies, condenses, vibrates, stimulates, and by continually changing the state and density of this elementary fire, not only gives motion and gravitation to surrounding worlds, but doth, on principles occult, impart life, vigour and growth to all animals and vegetables. It is a species of itself, and totally distinct from all other bodies.

This elementary fire not only exists in animal bodies on an equilibrium with those substances with which they are constantly connected, but the common air, especially when cool, imbibes a large proportion of this elastic fire. The lungs inspire this air, the fire mingled with it is dispersed through the pulmonary vessels into the blood; the whole mass of fluids are, in a degree, fermented and enlivened, and the vessels being at the same time more filled and distended, their tone is quickened, and the circulation accelerated; all the animal functions are, in part, put in, and preserved in motion, and the whole system is invigorated by this single agent.

If it is granted, that totally non-conductors become such by their imbibing, in some fixed form, a large quantity of this elementary fire, which it is supposed so far constitutes these bodies, that they are incapable of conveying an

electric shock, then it will follow that cold air, which any one may easily know is a non-conductor, imbibes, as was before suggested, an immense quantity of this electrical fluid. The consequence then is, that the lungs serve as an electrical machine to all animals, keeping up a constant insolation, by which the system is invigorated, as was before described; this insolation is subject to continual waste, partly by perspiration, partly by internal heat which subdues its elasticity, and partly by those less electrified bodies with which they are necessarily connected.

These operations may be called natural insolation; but as I am hereafter to describe the effect of the artificial insolation, the peculiar effects of the natural will be rendered more obvious and certain.

*Electric fire promotes the vegetable life, &c.*

THAT this effluvia promotes the vegetable life and growth will not be questioned by those who are made to believe that it produceth that effect on the animal. The most that hath been said of its effects on the animal, will apply to the vegetable, except the action of the lungs, and by their action, a higher life obtains a higher and a greater supply, as is necessary for its support. But a single experiment will put it beyond all doubt, that what I have ventured to call a natural insolation, doth exist, and produceth the described effects, and this will ap-

pear by adding a little of the artificial fire to, which may be done thus: Prepare, at the proper season, a box of earth sufficiently moist, place it on an insulating stool or stand, sow in it lettuce seed; at the same time sow the same kind of seed in a garden bed; this being done, immediately electrify the box of earth on the stool, and keep it continually insulated, and it will bring the lettuce to perfection in one half the time of the former. This circumstance alone is sufficient, in my opinion, to put the matter beyond all doubt, that this elementary fire is the principal agent in promoting the growth and life of vegetables.

And it will be shewn, in its proper place, that the artificial insulation of the human body is as conspicuous an evidence of the same element being the main cause of life, motion and vigour in the animal creation.

*The action a direct stimulus.*

THAT this elementary fire, electricity, or by whatever name it is distinguished, is a stimulus, is obvious from all that hath been observed of its effects on animal and vegetable life. The fluids of animals and vegetables contain more, in proportion to their bulk, of this elementary fire, than the solids of either; and it is the peculiar propensity of this effluvia, to put in agitation any bodies capable of moving or of being acted upon by this agent. Thus the heart of every animal gives the first motion to



the blood, this perpetuated by the dilation and contraction of the arteries; at the same time each particle of the fluids has attached to it a globular atmosphere: this atmosphere buoys up, enlivens and facilitates the flow of blood thro' every part of the system; and being contained chiefly in the fluids, doth, in some degree, fill and distend the vessels, and thus excite their action. It is my opinion that could this element be extracted from an animal or vegetable, there would be an instantaneous decay, which would soon terminate in the death of either.

In supporting the diminished life of the vegetable, a diminished action is allotted to this effluvia; its globular atmospheres always tend to propel, buoy up and diffuse to every the most extreme part of every flower and branch of the spreading tree: And it is on this principle only we can account for the juices ascending and diffusing themselves throughout the vegetable growth.

*Deficiency† of ethereal fire subversive of health.*

LIFE and health being so much suspended on a full supply of this quickening principle, it follows that any deficiency thereof must tend

† I must own, that I am staggered in determining whether this deficiency, as I call it, doth consist in the reduction of the elasticity of ethereal fire only, or whether, by some means not yet understood, elementary fire is absolutely dissipated and diminished in quantity—its elasticity must be reduced to promote the vegetable growth, for the vegetable life subsides.

directly to diminish life and health either in the animal or vegetable creation : as it respects the animal life, the deficiency is in the air, the lungs are not sufficiently vitratéd ; as it respects the vegetable, the soil is deficient in containing it.

*Deficiency of ethereal fire causes diseases of debility.*

A CONTINUED deficiency of existing powers, tend to induce diseases of debility, and inasmuch as they arise from deficiency of stimulus, are denominated direct, or diseases of direct debility ; as this respects the animal life, the remedy is the artificial insolation, opium, brandy, and the more durable stimulus of diet, &c. As it respects the vegetable life, the remedy is water, and such manure as contains a greater quantity of this elementary fire. It was contended before that there is a vast disproportion in the quantity contained in solids,

in the winter season. When this element becomes very dense and elastic, their fluids cannot flow in consequence of this resistance to motion. I am most apt to think, that the reduction of elasticity is a diminution of the existing quantity of ethereal fire—but perhaps some future experiment may convince me of a mistake. This element assumes such a variety of appearances, and produces effects as various and as unaccountable as the phenomena of its appearances, that perhaps it will be the business of ages fully to comprehend them all. But one thing I am certain of, and that is, as this elasticity in air subsides, animal life languishes ; and that the artificial insolation directly invigorates the system.

(metallic substances excepted) compared with that which is contained in fluids; hence there is not only a deficiency of this element in the circumambient air, by reason of heat; but through the inability of the soil to contain this element, there is also a deficiency—dry loam, sand, &c. contain but a scanty portion of this elementary fire.

There is reason to believe that the plaster of Paris is highly impregnated with this fire, for it is a non-conductor, as also lime; but this is said to be imparted by culinary fire, in burning the stone; after the same manner it is imparted into the ashes of wood, which renders them so valuable a manure. Some suppose it is imparted into iron, to render it steel; and is contained in great quantities in a fluid form, as in spirits by distillation.

*Intense heat causes a deficiency of this quickening effluvia.*

NOTWITHSTANDING what hath been said above of imparting elementary fire by the culinary, which is but a different modification of the same element; yet the instant these bodies, or others similar, undergo this heat, they appear to be divested of that which is peculiar to them in their cool state; glass, in particular, when heat to a certain degree, will receive and convey the electric shock as freely as brass or steel; but as soon as it is cool again, will make the same resistance as before: this resistance is

supposed to be made by the vast quantity imparted into the substance of the glass in the furnace ; but however that may be, it is certain that whenever it is again rarified by heat, the resistance is lost, the imparted element subsides, and the properties of the glass appear to be essentially changed. However, as to the truth of this element's being imparted in any form, I am not anxious to maintain it ; it is not much to my purpose, it is rather the opinion of others : but it is to my present purpose to shew, that the rarification of heat, causes a deficiency of this electric effluvia, which is so necessary to life and health. It being so far evident, that some bodies contain so much of this ethereal element, as their natural quantity, in a cool state, that they resist the approach of an additional quantity, made by art, as glass, bees-wax, tallow and some other bodies ; yet when these bodies are rarified by heat, they become divested of this natural quantity, or at least of its elasticity, and will as freely receive an additional quantity as iron or water, which quantity is supplied to them by the artificial machinery. If we apply these reasonings to the element of air, which in a cold state is as much a non-conductor as glass, bees-wax, &c. and undoubtedly from the same cause, viz. its own excessive natural quantity ; it will follow, that heat, in proportion to its degree, divests common air of this ethereal element, or of its elasticity ; the consequence is, that in propor-

tion as the air is divested of this essential property, the animal life must suffer in respiration; the lungs receive and supply less of this animating and quickening power, and the animal functions grow more and more languid, and impaired; and if continued long, must terminate in diseases of debility. It would be superfluous for me to observe, that diseases of debility are peculiarly frequent in hot countries and climates; I mean rather to trace the cause to its source; and if it should appear to be a deficient supply of this ethereal fire, I shall lay a foundation for what I shall hereafter recommend in diseases of debility as an excellent remedy, viz. the artificial insolation, with some light shocks to accompany the insolation.

Glass, by being rarified by heat to a certain degree, loses its transparency and elasticity; the same seems to hold true of common air; when the air is thus rarified by heat, with what difficulty do the lungs expand! Fowls that are used to soaring aloft, and drawing in full draughts of this pure ethereal fire, attached in great quantities to common air, will instantly expire if brought into a light rarified state of air by a fire side.

It would seem, that the elasticity ascribed to common air, should rather be ascribed to this elementary fire attached to it, as also its motion: there is reason to believe, that, was common air totally divested of this ethereal fire, it would remain as inactive as a pond of water.

I have observed one circumstance that induces me to think this is the case ; I have observed, that when a thunder-cloud hath passed, highly charged with this fiery element, or electrical effluvia, attached to common air, it is diffused or blows in every direction from the cloud; even when it hath gone by, it will blow strongly back upon you: the force of the effusion or blowing, is in proportion to the existing degree of heat beneath the cloud, which heat constitutes a vacuum ; and partly in proportion to the existing quantity of electrical effluvia contained in the cloud. It is more than probable, that clouds which discharge snow in winter, contain equal quantities of this elementary fire with those that emit that element in an expanded form, during the hot seasons ; but the element in which they float, viz. common air, is equally impregnated with the same element ; hence there is no approaching vacuum ; and consequently, no effusions or emissions of electricity expanded, or lightning ; no hurricanes, no tornadoes, in any clime where this equilibrium is widely extended : and the extension of the equilibrium is determined by the same degrees of existing cold, throughout any particular clime. As it may be entertaining to the inquisitive philosopher, I will endeavour to explain, in my broken manner, the foregoing principles, and demonstrate that the whole phenomena of gravitation and motion are founded in, and performed by the various



states, effects and operations of this ethereal element, called fire, when expanded. In attempting a thesis so occult, intricate and novel, and within such scanty limits, my reader will undoubtedly complain of some deficiency of demonstration ; but as the resources of evidence, in respect of gravitation and motion, have occupied but a little of my attention, and are, from the imperceptibility of the element in which they are undoubtedly founded, so exceedingly remote from observation ; I hope I may be excused in what may appear deficient in point of investigation of the principles.

A basis of considerable part of the subject is already executed, and presented to my hand, in a late publication, entitled, “ The Studies of Nature,” by a new prince of philosophers. I mean the immortal DE SAINT PIERRE, whose capacious soul seems to have grasped almost the whole visible creation, explored innumerable laws and harmonies throughout the animal and vegetable world—all stamp’d with divinity—all paying homage to a God infinitely wise, who is seen in the things that are made. This philosopher, like the eastern star of old, guides, not very wise men, but atheists and deists, and points them to their knees before the infant, infinite Bethlehem God ! Henceforth, let no man boast of talents, who would darken the light of nature, whose reflective rays, under the ken of true philosophy, appre-

hend a God ; nay more, a God incarnate ! This truly great philosopher sees all creation harmonizing, but man ; him he proves defaced, self-exiled from his God. I know not whether the capacious or moral beauties of his mind outshine ; his productions have lessened the dignity of a Newton ; yea, all that name philosophy, must stand before him bare, as comets, fronts of atmosphere, when they approach the effulgent glories of a sun.

This author has accounted for the currents in the seas, in a most judicious manner, and upon principles entirely new ; but these principles exactly correspond with my doctrine of gravitation and motion ; and prevent me of a task, to which I should have been inadequate. In treating of the diurnal motion of our globe, I shall have recourse to the currents of the seas, and shall take the subject up, where this author has left it. He has not only demonstrated that these currents do exist in the oceans ; but also, that they proceed from the half-yearly melting of the ices, in the polar regions alternately. In addition to what he hath advanced on the subject, I shall take the liberty to consider these currents as proceeding upon the true principles of gravitation and motion. It must not be understood, that I mean any contradiction to what De Saint Pierre has taught on this head, but only to analyze the subject of gravitation and motion. It is necessary to treat of these causes and their effects in



different terms. I shall also make a further use of these currents in preserving the torrid zone.

In order to make it apparent, that gravitation and motion have their origin in the various states or degrees of density of this ethereal electricity, if I may so call it, I shall endeavour to describe, in a very brief manner, the evidences of these different states on which I build my doctrine of gravitation and motion in our globe, and probably in all worlds. I shall, in the progress of this subject, use the term ethereal fire, designedly substituted for atmosphere; and shall premise, that this element fills infinite space, and is as an ocean, into which the Author of nature has launched all worlds; and that the sun of each respective system doth, by its inherent qualities, induce the gravitation and motions peculiar to his own system.

This ethereal element, which I think is deservedly called the soul of the universe, (for without it, neither animals nor vegetables could live, nor harmony exist in all those swarms of worlds that float, as it were, in her bowels, and are governed by her laws) assumes a variety of states and powers. I call it fire, because, when it expands, it is capable of giving flame to combustibles, as lightning will fire a tree, buildings, and many bodies. The spark from an electrical machine will give flame to spirits; and if the spark were suffici-

ently copious, it would produce all the effects of lightning. I call it frost, because, according to the existing degree of its density, so is the degree of cold. I call it inflexible and unyielding, because, according to the degree of existing cold, so doth this element make resistance to the motion of other bodies, to which it is attached in great quantities. When this element is diffused copiously, it becomes luminous, as in the aurora-borealis; and tails of comets, it may be, are of the same description. I will endeavour to illustrate these ideas, partly by the artificial electrical machine, and partly from other sources.

There are so many people that have been charged with this ethereal element, from the electrical machinery, who have received no kind of warmth from the insolation but what arose from the quickening of the circulations; but by applying their finger nigh enough to a glass of spirits to emit the spark, the spirit would take flame from the fire emitted from the finger, that I need not use much argument to prove that this element is the progenitor of flame, although, in its primeval state, it is not possessed of that quality we call warmth in any degree. Even when this element is diffused so copiously as to appear luminous in time of night, it gives a sensation of cold: This may be perceived by holding the hand before a pointed wire which is in contact with the prime conductor of an electrical machine, and the machine charged,

the effusion will proceed from the extremity of the point, and has all the appearances of the northern lights; but the illumination is visible only in a dark room.

That the existing degree of density of this element determines the existing degree of cold; or, contrariwise, that the existing degree of cold determines the existing degree of elementary fire, unexpanded, I shall produce the following evidences; viz.—It is evident, by charging an electrical machine, that more of this electrical effluvia, or etherial fire, pervades the circumambient air of the machine in cold days of winter, than in warm summer days: the machine will not only charge much higher, but the fire is promoted more freely. This circumstance is a conclusive evidence, that the degrees of cold are determined by the existing degrees of density of ethereal fire. My reader will please to excuse my paradoxical terms, seeing it is the same element, but in different states or degrees, of which I am treating, that has all the opposition of fire and frost: But I shall bring forward more evidence as I proceed.

That this ethereal fire is possessed of an unyielding, inflexible quality, according to the degree of its density, or of cold, I produce the following evidence, viz.—I have invented a very simple mean of ascertaining the quantity of a charge, in a receiver, which I call an electrometer; and it faintly represents a system of globes, when the machine is charged. It is done

thus: I cut into a round seven or eight pieces of cork, the size of small peas: I make them fast to the ends of as many fine linen threads, of six inches long: these are to be made fast by the other ends of the threads to a large wire, the bigness of a pipe-stem: one end of this wire is placed in a socket in the upper side of the conductor, and must be about eleven or twelve inches long, and the threads seized to the upper end: the top of the wire must be covered with bees-wax, to prevent the fire from flying off: the balls will hang about midway of the wire. The demonstration made by this artificial system, if I may venture to call it such, is very singular, and not only reflects light on the subject of the last paragraph, but presents a phenomenon to view. I will describe it.

If the machine is charged in a warm summer day, these balls will suddenly condense round themselves quantities of the effluvia, by which they may be, in a cool or dry day, repelled to a horizontal plane, and sometimes higher; but this is by means of the wire on which they are suspended, which also contains a quantity, and tends to buoy them up. If you approach them with a lighted candle, they will revolve from the two extremes of the horizontal plane of their atmospheres,\* to the lighted

\* It will be observed that I have used the term atmosphere, but it is for distinction sake. Atmosphere impinges on atmosphere, and makes one undivided whole; atmosphere governs not, unless it impinges on another; this element will not re-

candle, which may be called their perihelions; thence they take a retrograde motion, and revolve round each other, till the threads bring them into close contact. This phenomenon I beheld with admiration; I tried many other bodies, hot iron and cold iron; they produced no such effect: In short, I have never been able to find any body, save light, that would produce any such effect. They will attract to any bodies less electrified that will convey the shock; but if a body higher electrified approaches them, it will repel them, at a given distance, that is, as soon as their atmospheres impinge on each other; just as the sun will repel an inferior atmosphere of a comet, at a certain distance.

The revolutions produced in the artificial system, appear calculated rather to explain cometary astronomy, than planetary. I can discover nothing that looks like rotation upon the axis of a globe. They first gravitate towards the candle, or artificial sun, and will approach, comet-like, within just such a distance, and are then repelled. If you would force the lighted candle upon them, they will avoid it in every direction; but if you extinguish the flame, the whole system will fall into contact with it. Hence light is the agent, the nature of which deserves our attention. There is no flame nor light but what proceeds primarily from electric

pel its own particles, unless in near contact—nor will the sun repel a comet, but at a certain distance, notwithstanding its infinite density of the same element.

fire ; this is the mother of fire and of light. I have supposed the sun to be an infinite densification of ethereal fire, which constitutes his brilliancy. We may suppose, from one circumstance, that the burning of tallow in a candle, forms a light, the nature of which is the nearest to that of a sun, excepting such other bodies as bear a correspondency to tallow. The same quantity of blaze, made by fuel, doth not contain half so much light as that of the tallow candle. The reason I shall assign for it, is this : tallow is one of those bodies which inherits so great a natural quantity, that it will not receive any artificial quantity, in consequence thereof, and being thus united by some inexplicable law in the substance of the tallow, is with it emitted, or as it were oozed into flame : this operation is a medium between the effusion and expansion of ethereal fire. I will name it *flamumfusion*, that is, fusion with or in flame. This *flamumfusion*, or ethereal fire in flame, in or with the tallow, produces forcible rays of light, and very aptly mimics the action of the sun's light upon her system. It will appear that I am certainly right, when we consider that what I have ventured to call *flamumfusion* of electric fire, produces the same repulsive effect upon my artificial system, that the greater electrified ball produces upon the lesser—hence there must be electric fire (give it what name you will) contained in the blaze of the candle. But this artificial system resists motion in severe cold,



or according to the degrees of the natural density of ethereal fire—the warmer the weather, the quicker is their motion. This my reader will please to bear in mind, until we shall account for the quickening of the earth's motion, when the sun is in the southern hemisphere, and her nigher approach to the sun, as well as the inequality of her rotation upon her axis.

But I have a further use to make of my artificial systems; for they do not only resist motion from the approach of light, in proportion to the existing degree of density of this ethereal fire, or cold; but they resist motion from other causes; thus, in charging the machine, in severe cold, they are very obstinate in repulsion, and the operation must wait some time to discover the diameters of their atmospheres, which is determined by the distances of the globes (which by the way discovers the quantity of the charge in any particular receiver.) In arriving to their utmost distances, they are evidently resisted by an unyielding quality or property, peculiar to an increased natural density of this ethereal element. Again, when the machine is discharged, there is the same resistance in their coming into contact with each other; but in warm days of summer, they are immediately repelled; and on discharging the machine, they are instantly in contact again.—But if it should be asked whether this resistance is made by the density of the surrounding effluvia attached to common air, or whether it

in any degree arises from the immensity of the effluvia, that forms the plus electrification in the receiver and throughout the machine; I answer, in extracting the spark from the machine, there is evidently a resistance; the artificial quantity inherits the quality of the natural. The plus electrification is not voided, and the equilibrium restored with a single touch in a cold day in winter, as in a warm summer day. This confirms one point, viz. that the resistance is absolutely founded in elementary fire, according to the degrees of its density, and that the existing degrees of cold are the criterion by which it may be known. Furthermore, it is something probable that the natural, if not the artificial density of ethereal fire, may be promoted to such incalculable degrees, as to render all means of expansion utterly impossible; and it is not improbable that the great Author of nature has constituted the luminary of day upon these very principles: it is very evident that the sun of our system possesses the qualities of electrical fire; it certainly repels the atmosphere of a comet, as one plus electrified ball in an electrical machine will repel the atmosphere of another, and the lesser atmosphere gives place to the greater. The amazing brilliancy of the sun, may also arise from its infinite density; what has been said of the transparency of glass, may reflect some light on the subject: Electricity becomes luminous by copious effusions, as before observed, but unexpand-



ed. The air is more brilliant in severe cold, or according to the degree of the existing density of the electrical element attached to it.—The liquid element, as water, becomes more luminous when congealed to ice by the intenseness of the extreme density of the same effluvia. But it is peculiarly necessary that I support my last proposition, that is, that water is congealed by this elementary fire unexpanded; I prove it thus: there are several bodies, that from their own inherent natural quantity, as glass, beeswax, tallow, &c. resist the approach of an artificial quantity, as hath been before observed, until by warmth that natural quantity is diminished; the same holds true of ice, and of snow, in a degree; an icicle, in severe cold, resists the spark from the prime conductor of an electrical machine, or is at best but an imperfect conductor; whereas, let it be resolved to water, which must be done by warmth, and the resistance to motion is entirely lost, both in respect of its own particles, and that of the electric spark. Hence it is evident, that its brilliancy arises from the excessive quantity of the ethereal effluvia impregnated into this liquid element, which also congeals it to ice. From all these circumstances, it appears that an increased density of the electrical effluvia, is an increased degree of brilliancy, and in the hands of its divine Author, may be increased, *ad infinitum*; and consequently we have every reason to believe that this element, which I call the soul of the

universe, is wrought by the finger of God into such an encreased degree of density, as constitutes the unapproachable lustre of the sun.

Here let us pause a moment, and behold the wisdom of the great Architect. This ethereal fire which pervades all creation, in a degree, is the source of life and growth to the whole family of animals and vegetables; and, as we shall by and by perceive, produces all the phenomena of motion, in earth, air and seas—see its utmost glories consummated in the sun; behold him as the envoy of heaven, sitting regent, as on a throne of state, and by tacit thunders of his laws, bids his system roll in orders intricate and multifarin—looks on the frigid zones, bids their ices yield to liquid form, and flow profuse from pole to pole; nor lets the limpid ocean sicken beneath the lustre of his face, nor air, nor seas in frantic forms appear. But these notes are a little premature; it is time to recapitulate those principles which have been laid down as a leading clue to the investigation of the doctrine of gravitation and motion, and on which I shall endeavour to make it appear they are founded.

I think it is experimentally demonstrated, that this ethereal fire is as extensive as earth, air or water—that it pervades infinite space; that, however certain immense bodies of it may be attached to particular globes, yet this body effects no government, but by being in near contact with other bodies of the same element;

which is nearly tantamount to what was said before; it is as an ocean, in which floats infinite creation. It is furthermore demonstrated, that this ethereal fire\* assumes very different appearances, and opposite states and effects, according to the degrees of its density; that in an increased degree of its density, motion is resisted, both in respect of its own body, and of those other bodies in which it exists—that the congealing of water to ice, is a specimen of its density and inflexibility—that notwithstanding water is as apt a conductor almost as steel or iron; yet when it is congealed to ice, or imbibes an increased degree of this inflexible effluvia, it will resist the electric spark; this is undoubtedly caused by the increased degree of its own natural quantity of fire; and it is furthermore evident, that an excessive natural degree of electric effluvia, will make resistance, even to the expansion itself of the artificial degree.

It is also demonstrated that warmth, in proportion to its degree, destroys the elasticity or unyielding inflexible qualities of this ethereal fire; and that by producing this effect, motion proceeds, both in respect of the elementary fire, and of those other bodies with which it is in contact, whether it be earth, air or water; and

\* Although it is hard for us to conceive of fire without burning; yet as there is no fire but by the expansion of this element in some form or other, I have ventured to use the term fire. It certainly appears to be the mother of fire and of suns.

that this warmth is produced by the action of the sun's light, no one will pretend to dispute; it is become too familiar to our senses to need any argumentation to illustrate it. We have noticed and demonstrated, by actual experiment, that light will produce an effect upon an artificial system of globes, which no other body can be found to produce; that the light of a candle will produce motions, which may be demonstrated perihelions and aphelions, and some other motions which cannot be at present fairly explained and applied to the systems of nature, because the globules are constrained by the threads on which they are suspended. We have made it apparent, that this electric effluvia is not possessed of the quality of warmth naturally, or in the state of nature, but that warmth is an effect of its action, or expansion—it produces warmth in animals by accelerating the circulations—it is literally fire when it expands, and takes the name of culinary when it acts upon fuels. We have observed, that it becomes luminous by effusion, instanced in its evaporation from the point of a metallic rod, and in the aurora-borealis, and in the tails of comets—that it becomes luminous by condensation, instanced in glass, ice and air; and that inasmuch as density resists expansion,\* we have

\* Were not this the case, that natural density resisted expansion, the sun might expand, or emit globes of sparks upon his system; and by destroying them, would be himself destroyed.

every reason to conclude, that the sun of our system consists of an incalculable condensation of electrical fire. We noticed the similarity of effect produced by the sun upon a comet and that of two electrified balls, in an electrical machine ; and that the greater body of fire governs the lesser.

Having briefly stated the powerful agency of this hidden effluvia, and considered her various forms, states and effects ; let us now apply her laws, and see to what they will amount in constituting gravitation and motion, in our globe.

First, These principles will account for the currents and fluxes in the seas or oceans. These currents are minutely described by that ingenious philosopher De Saint Pierre. This great man, however, having never entered into this ærial system, ascribes this effusion from the poles to the thawing of the ices simply : I doubt not but the thawing of the ices is necessary to promote these currents ; but it is evident, from the foregoing arguments, that air must have the same anti-elastic effect produced on it, in order to produce a general fusion from either of the poles towards the equator ; and indeed, for certain purposes, to be hereafter described, the Author of Nature has appointed them a much longer tour.

We will now suppose the sun to be passing into the northern hemisphere ; the consequence then is, that the action of her light upon the circumambient air and waters, which have, du-

ring our winter, been retarded in their motion, in part congealed to ice, and totally suppressed, is again put in motion; the inflexibility of this pervading effluvia is taken off by warmth; the ices assume a liquid form; the same resistance to motion, in the air, is removed, and both elements pour profusely from the polar regions; and this resistance is diminished more and more, until it reaches the zenith of the sun; this point admits of the highest state of rarification, and, consequently, forms the most complete vacuum, or place of non-resistance; and to this vacuum, or space of least resistance, the waters gravitate, as well as the air, freely. But, notwithstanding, the zenith of the sun is the central point of gravitation to the waters; yet from the amazing velocity of the motion of the waters from the northern regions, they are not stayed, even in the centre of gravitation; their impetuosity hurries them on a great distance towards the south pole; and, as De Saint Pierre has very plainly shewn, the Atlantic current doubles the Cape of Good Hope, and forms a current along the coasts of India: the currents continue till the autumnal equinox. The excessive effusions from the north pole, during our summer, is partly occasioned by enormous quantities of water, accumulated in the polar regions during our winter, and retained, on the principles of condensation, before explained, in the ocean, bays, lakes, &c. as well as in the



air ; the exhalations from the waters, in warmer regions, are carried by southerly currents of air, into colder regions, where they become condensed, and remain until this density is removed by the warmth of the sun. These enormous accumulations, when the resistance to motion is taken off, pour in torrents towards the latitude which the sun then occupies ; which is the centre of gravitation to this effusion : but as this accumulation is an overbalancing proportion of the liquid element, it exceeds the bounds of natural gravitation ; and its currents are experienced in all the southern regions, nearly to the south pole.\* The currents that proceed from the fusion of the south pole, during our winter, likewise, force their currents nearly to the north pole, where their waters become condensed, and accumulated in great abundance. These half-yearly accumulations, and half-yearly fusions, are of the most essential utility ; and, indeed, without them, the oceans would become uninhabitable, or impassable to mariners. The elements within the tropics would undergo such alternate rarifications, as would induce

\* I cannot, here, undertake to transcribe De Saint Pierre's detail of the general currents, counter currents and monsoons, from the half-yearly fusions of the poles : his writings, from their singular merit, it is hoped, will soon be in the hands of the most of people, who have any taste for useful information—for that knowledge, which must make an atheist blush for his ignorance ; and they, indirectly, confront the deist with equal force. This author proves that design which implies infinite intelligence, throughout all nature.



tornadoes, that would sweep the face of creation, and spread devastations throughout the tropical regions, at least. This we may be assured of, by reflecting for a moment on that wild disorder of the elements, which takes place when the sun arrives at the equinox, at which time the currents are stayed, and the waters, as well as the air, remain in the same latitude; the intenseness of heat, generated by means of the sun's light acting upon the same portion of these elements, produces effects much to be dreaded; tempestuous winds, from time to time, raise the briny billows almost to the clouds, and plunge navies in her bowels, or sweep the neighbouring strand, and lay whole cities prostrate in ruins. Some of the ancients supposed the torrid zone to be uninhabitable; this must have been the case, had not the all-wise Author of Nature, whose superintendence appears more and more conspicuous as we understand nature, ordained these alternate currents, both in the liquid and airy element. These currents, as I before observed, not only diffuse a more general warmth over the face of the whole globe; but they likewise prevent that devastation, which otherwise would depopulate the most charming part of the earth.

Here then we see, that motions in air and water are encreased, in proportion as the inflexibility of the ethereal fire is diminished; and this is diminished in an exact proportion

to the existing degrees of warmth. Moreover, this latent heat is promoted, more or less, in proportion to the qualities of that body on which light is reflected, and according to the smoothness of its surface and flatness of its opposition to that body of light, acting upon it. This may be perceived, by holding a flat piece of metal nigh a fire-light, as pewter, or tin; and if you oppose your face or hand to the pewter or tin, while the light of the fire plays upon its surface, it will reflect a sensible degree of warmth upon your face : \* the metal must be held obliquely to the fire (which, however, lessens the action of light) in order that you may approach it, without intercepting the light from the metallic substance.

But there are other bodies that reflect no such warmth. This is the refractive or reverberatory power of light, and not culinary heat, if I may use the term; for the metal will remain cold, and may be held so far from the fire, in a winter evening, that water shall freeze at a lesser distance. From these things we may learn, that the liquid element reflects the rays of the sun, more strongly than the earth; that these refractive operations are still

\* From this production of warmth, is it not probable that a dwelling-room might be rendered sufficiently warm, for the winter, by sheathing, or lining the room with tin, and keeping up the bright light of a lamp in its centre? but perhaps it would be necessary to exclude the light of the sun by windows, as contrary illuminations might prevent the regular action of either.

greater when the waters are calm and smooth : hence the alternation so often from calm to tempest ; and from tempest, which diminishes the rarification, to calm. Let the sun be a world of culinary fire, if you will ; nothing but its light, produce any effect on this globe —its rays penetrate through millions of miles of eternal cold, and produces rarifications, various as those bodies on which they are reflected. The sandy, desert plains of Africa, are more reverberatory than any other part of the earth, and the greatest rarifications are produced there. It is from these different degrees of rarifications, that the currents of air are produced : thus it is that the currents of air are in so much conformity to the currents of water. The monsoons in India, as well as in some other places, are in conformity to the currents of water, (their counter-currents excepted ; ) but the currents of air change fifteen or twenty days sooner than the currents of water ; the elasticity of air, or its inflexibility, is reduced, and commences motion so much sooner than the icy condensations of the polar regions. The diminished states of rarification on the land, compared with that over the water, (sand plains excepted) sets bounds to the currents of air, in the same manner as the land sets bounds to the currents of the waters ; though not with the same degree of minuteness. Clouds, also, intervening in particular parts of the hemisphere, may, and do, all over

the globe, change the states of rarification, and of course, determine various shifts of wind. It will be endless to trace all these vicissitudes of currents, and observe their immediate causes ; enough hath been advanced to explain the principles of the doctrine of motion, as it respects air and water ; and it is undoubtedly possible, by these principles, to account for every different current of air, by land or sea. But there is a current of air, called the Trade Wind, which blows across the Atlantic Ocean, nearly from east to west, along the equator, until it is intercepted by the mountains and lands of South America, where the rarifications are diminished, and the current ceases. This apparent current of air is induced by the velocity of the earth's motion at the equator ; being of greater diameter there, than in any other part, consequently her motion is proportionably quicker ; add to this also, that the elasticity or inflexibility of this latent fire, which, as I have before argued, gives all the power of motion to common air, is reduced, more or less, continually, at the equator : and it will appear, that this current is only apparently such ; just as a man, riding full speed on horseback, will experience a sensation of being met by a current of air ; which, however, in a calm day, will subside as soon as he comes to a halt.

But it may be asked, why is not this current uniform in all parts of the equator, round

the globe? To which I answer, there is not the same continued degree of rarification from east to west, in any other part of the equator, as from the Indian Ocean, across the burning sands of Africa, and thence across the Atlantic Ocean, until you reach the mountains of South America. It appears to require a lengthy tract of rarification to constitute this apparent current of air. Other circumstances may likewise occur, to intercept this passive state of air. The equator is continued a great distance on the Western Ocean; but observe, these waters continue quite to the south pole, and almost to the north; and the rarifications become more extensive and various. But the rarification which gives rise to the Atlantic current of air, called the Trade Winds, has its focus in the sandy plains of Africa, where the rarification is undoubtedly higher than in any part of the liquid element. And, although this current of air is not perceptible until you come some distance into the Atlantic Ocean, yet that will not prove that it has not its focus in these burning sands, where the heat is so very intense, as to fire some combustibles. And it is likely it is rendered perceptible, finally, by imbibing the exhalations from the Atlantic, as it glides under it. Furthermore, the variation of soil, north and south of these oceans of sand, limits the extent of the rarification, and determines it to be near the equator. Hence, the surface of the earth, at the equator, rolling

with a velocity more than one thousand miles in an hour, glides under this detached portion of air, till it is met by the mountains of South America, or its circumambient regions of denser air. These appearances subside at the time of the vertical equinoxes; the currents in the waters then subside, and the rarifications in the Atlantic become more intense and extensive, which cause various shiftings in the currents of air, and terrible hurricanes; and, as I before observed, would lay waste the torrid zone, had not the all-wise Author of nature ordained these polar effusions, which cause successively new portions of air and water, except at the equinoxes, to receive the vertical flame of the sun; which also keep up a more equal degree of warmth throughout the globe.

These new principles of gravitation and motion will, if I mistake not, account for the diurnal rotation of our globe upon its axis. In treating of the polar effusions, we considered the centre of their gravitation to be the vertical of the sun's zenith; but from the overbearing of the torrents, from either of the poles, when in fusion, they break through all restraints, and, to serve a wise purpose, spread from one frigid zone to the other. But I shall contend, notwithstanding, that the vertical point of the sun, in any part of the different oceans, is a central point of gravitation to the waters; that this vertical flame of the sun, forms the most consummate non-



resisting vacuum; that the waters, in eternal succession, gravitate from the two extremes of the polar regions, in a degree; and, indeed, from an extensive circle, to a vertical point with the sun: and that the gravitation of the waters to this non-resisting vacuum, gains a preponderating heft to the opposite part of the globe; and by this overbalancing weight, the motion of the globe is perpetuated on her axis. That the waters rise in this highly rarified vacuum, is certain;—the volatile particles will even ascend from the surface, as high as the rarification is reflected, into the hemisphere. But what will render it still more certain, the evening tides, in the same latitude with the sun's zenith, are always greater than the morning tides.\* What can be the cause of this? Sir Isaac Newton would answer, it is the centripetal force of the sun, or moon, or both, depressing the waters, causing them to fly off from this very point, of which I affirm they gravitate, and by this depression on their bowels, as it were, they flow more forcibly upon their shores.† But how

\* These alterations in the fluxes of the oceans, De Saint Pierre ascribes to the half-daily effusions of the poles. With much deference to the opinion of a genius so much superior to me, I must take the liberty to ascribe them to a different cause. This great man seems to have comprehended every thing in nature, but the powers of this latent fire; which must have involved him in some mistakes—but he hath graced them well.

† De Saint Pierre has sufficiently refuted the Newtonian



doth it happen then, that this powerful depression doth not prevent the rising of the volatile particles of water? One would think that a power able to depress the very bowels of the ocean, would likewise prevent the ascending of a much feebler body. But the contrary of all this must be true: the sun, as De St. Pierre, and others, will allow, pumps up lakes of the liquid element, in a volatile form. This effect also, is most conspicuously produced in the vertical point of the sun, in this most conspicuous non-resisting vacuum. The waters in this highly rarified vacuum, form a prominence in the vertical of the sun round the globe, where there are waters for the purpose. Hence, as the sun retires, this prominence, or projection, may be said to commence a centrifugal motion, which motion will have a direct tendency to increase the flood on the shores. This is all that can be called centrifugal; and it proceeds from a cause, and in a manner entirely different to what the Newtonian system teaches.

Now as the waters gravitate to this vacuum only, while the sun is in the horizon,\* (for the

centrifugal and centripetal schemes; and has demonstrated them to be as erroneous, as they are useless, in apprehending the laws of nature.

\* In the horizon, &c. The full moon, according to the degree of her light, rarifies and diminishes elastic compression; and being opposite the sun, the secondary flux of the sun is augmented thereby. This gravitation of waters to the vertical flame of the sun, has been mistaken for a fixed projection of the globe at the equator. All that is centripetal—

second flux is an effect of the first) there is less exertion made towards the shores in the morning; and the tides are known to be less than the evening tides, in the same latitude. But these statements suppose the sun to be in the northern hemisphere; for when the sun is in the southern hemisphere, the focus of the tides is more remote, and the highest tides will be in the morning, in the northern hemisphere; for more time is required for the same cause to send its effect in the ocean to so much greater distance. But if the tides had their focus in the polar regions, the tides would cease when the sun comes to the equator; for the fusion of both poles cease at this time, or are in equilibrio, or totally silenced, and the currents of either are at an end for a time; but it is certain that the tides do not cease to ebb and flow during the equinoxes: hence, I think our latest and greatest philosopher ascribed them to an improper origin; but he had a very plausible appearance of truth on his side. The retardation of the tides may be ascribed to the continual variation of their focus, both in latitude and longitude; but it will exceed my scanty limits to enter into a detail of so many particulars as are suggested to my mind on the occasion. I have even forbore to notice in the text the effect produced by the light of a full moon,

is the elastic compression of ethereal fire, in the absence of the sun; and this causes a kind of centrifugal motion, or flood, upon the shores.

whose light, according to its degree, rarifies and promotes non-resistance, as well as the sun.

It is time to hasten to my next and last argument, to prove that the sun's light gravitates under its vertical flame, a preponderating weight of waters, that cause and perpetuate the diurnal rotation of the earth upon her axis. The evidence I shall now bring forward, will put the truth of my thesis beyond controversy; it is this: the motion of the earth is quickened, when the sun passes from the equator into the southern hemisphere. The cause of this acceleration of the earth's motion, is obvious and rational, upon my new principles, as well as her nigher approach to the sun at the same time, and from the same cause. It is well known to all who have looked into the maps of the globe, that the greatest part by far of the eastern and western continents lie north of the equator; and as this preponderating weight is formed only in the waters, the motion must be lessened in proportion as the quantity of land is increased in the latitude of the sun.\* Hence, then, as the quantity of land is diminished in the southern hemisphere, the rarification upon the waters is more uniform and uninterrupted round the globe, and the preponderating weight

\* This new doctrine must strike one stumbling stone out of the way of atheists, who could never reconcile this waste of waters (as they call it) to the existence of an all-wise Creator. It is certain there is but just enough of water, to answer the purpose of necessary motion in the globe.

of the waters is more steadily kept up, than in the northern hemisphere; and the consequence is, that which we yearly experience, the motion of the earth is accelerated, five or six days, when the sun is in the southern hemisphere, where the waters are more generally spread round the globe. For the first time, then, this phenomenon is explained and rendered familiar; but on no other principle ever suggested, could this variation be accounted for. It has been supposed that it was owing to its nigher approach to the sun, that its motion was quickened; but we should rather say, the nigher approach of the earth to the sun during our winter, in the northern hemisphere, is owing to an increased degree of rarification in the southern waters, which not only quickens the motions of the earth in her orbit, but also causes a more powerful gravitation of the earth towards the sun.

But if all this is not sufficient to support my doctrine of gravitation and motion, I will add another incontestible evidence in support of it; and that shall be drawn from the consideration of the inequality of the earth's motion upon her axis, which causes the sun to be, apparently, sometimes fast of clock, and sometimes slow of clock.

If we examine into this case, we find that when the sun, as we call it, gains of the clock, it is because the quantity of waters are encreased under the sun, and the motion of the earth

is quickened; or when the sun grows slow of the clock, it is because the quantity of land, in which no motion is induced, is encreased under the sun. Any man may discover the truth of this, by comparing the calculations in the almanack, of the variations of the sun with the clock; and having a map of the globe before him, he will perceive that as the sun recedes from his greatest southern declination, or tropic of Capricorn, which lies over the points of the eastern and western continents, where the waters are most generally formed round the globe, and resistance to motion is most diminished of any part of the globe; that as the sun approaches the equator, the two continents, but especially South America, encreases in width towards the equator, and the consequence is, that the motion of the earth is diminished upon her axis; and the sun, as by calculation appears, grows slow of clock from the latter part of December, which is the time of the sun's leaving the tropic of Capricorn, until the rarification passes northerly of the greatest easterly and westerly projections of South America, to the isthmus of Darien, where the Atlantic and Pacific oceans are separated by a strip of land only sixty miles wide, and then the preponderating weight of waters is again encreased in the vertical flame of the sun, as before described, the motion of the earth is again accelerated, and the sun gains of the clock from the latter part of February, until it has passed

north of the equator some distance, and the continent of Africa is projected far west into the Atlantic ocean, and counter-balances the narrowness of the isthmus of Darien; and the variation of the sun with the clock is very little for several months, that is, until the sun approaches again near to the autumnal equinox, when the motion of the earth is again quickened upon her axis, and the sun gains sixteen minutes of the clock, by the last of October; after which, the rotation or motion of the globe is again impeded by the intervention of the widely extended land of South America; but this is of short continuance; because, as the sun passes from the equator towards the tropic of Capricorn, the two continents, but especially South America, diminish rapidly in width; and the rotation of the earth upon her axis is quickened sixteen minutes from the 7th of November until the 24th of December. But we may observe, that this acceleration of the earth's diurnal rotation upon her axis, is always later than the cause that produces it; and also, that it will be continued in full effect some time after the cause that produced it, has evidently declined its power.

It should be further observed, that notwithstanding the great encrease of waters in the southern hemisphere, especially when the sun is at the tropic of Capricorn, the rotation of the earth upon her axis is not quickened in proportion to the encrease of waters round the



globe, the cause of which is very obvious: the gravitation of water to the vertical flame of the sun, although it is greatly encreased all round the globe, or nearly so; yet it is formed at a lesser distance from the axis of the earth than that which is formed at the equator, and consequently has less power of promoting the rotation of the earth upon her axis. We may make the idea very familiar, by supposing a wheel, suspended upon a shaft, or axletree, to be put into a circular motion by placing a weight upon one of the spokes of the wheel: we readily know that the nigher the axletree or centre of the wheel the weight is placed, the less will be its power of inducing motion in the wheel, &c.—Thus it is with respect to the diurnal rotation of the earth; a greater preponderancy of waters is formed towards the tropic of Capricorn, in the Southern Ocean; but they are formed at a less distance from the axis of the earth, and cannot induce that velocity of motion which the same quantity of waters would do, were they formed or projected by the vertical flame of the sun at the equator, where they would be at a much greater distance from the centre, or axis of the earth.—This last circumstance is so obviously true and plain to the weakest capacity, I think it must be admitted as conclusive of my doctrine of gravitation and motion.

It is very probable that if this globe was all water, or all a transparent sand-ball, it would



gravitate entirely to the sun, or till it should come within reach of the repulsive force of the sun, which might also constitute this globe a comet. For as the reverberating rays of the sun induce latent heat, more or less, according to the quality of that matter on which it is reflected; so is the force of gravitation determined in that body of matter towards the sun.— But it is impossible for any globe of matter to fall into, or unto the sun; for the resistance of the sun must be in proportion to that infinite or incalculable degree of condensation of ethereal fire, which gives being to his inaccessible light; which condensation resists the approach of matter, at certain distances, with a force almighty. Hence the amazing velocity with which a comet approaches the sun, forces itself upon this resisting power, as upon the elasticity of a yielding bow, to a certain degree, at which degree the power of elastic resistance, like the bow sprung upon the arrow, induces the retrograde motion, and the comet is shot out into space incomprehensible. And it may be further observed, that the power of gravitation will reach the comet at a greater distance than it will some other bodies, and cause it again to gravitate towards the sun, in one eternal round of attraction and repulsion: and thus the laws by which comets are governed are dissimilar to those laws that govern other bodies; and this dissimilarity originates in the quality of their own substances,

From the foregoing doctrine of gravitation and motion, we may also account for the ecliptic motion of the earth in her orbit. This I shall consider to be induced partly by the alternate rarifications of the southern and northern hemispheres, and partly by the turning of the two polar regions alternately to the sun, by that rarification. Either of these motions would be sufficient to describe the ecliptic; but if only one of them was supposed to be the whole cause, the period, it would seem, might arrive, when this motion would cease, and fix the sun in the equinox. We will suppose the sun in the southern hemisphere, by which means the rarification round the globe is more towards the south pole than the north; the consequence will be, that resistance is diminished towards the south pole, while at the same time densation and elastic resistance and compression are encreasing upon the northern hemisphere: these united circumstances must have a tendency to gravitate the earth towards the south pole. Again, as this gravitation proceeds southerly, it brings the sun towards the equator, and its rays begin to reach the northern hemisphere and weaken the elastic compressive force of the northern regions, at the same time as the sun's rays leave the southern pole. Resistance to the southern declension is made by an encrease of condensation, which is an elastic opposition to the progress of the earth's gravitation southerly, till by slow degrees her southerly motion totally

ceases. And, as it was observed of the sun's opposition and repulsion of a comet, just so we may conclude the southern hemisphere operates upon the south pole of the earth; her motion is stayed by flow degrees, which also causes, at these periods, such little variation of time for several days, until the resistance in the southern hemisphere is sufficient to repel the earth into a retrograde motion towards the north. This retrograde motion is facilitated by the action of the sun's light upon the northern hemisphere, which in its turn is reduced to a non-resisting vacuum, or nearly so. Hence her northern declension proceeds on the same principles as her southern, just described, and terminates in the same manner. But, as I suggested before, these motions might lessen by degrees, and leave the sun fixed at the equator; and, as D. St. Pierre observes, set the world on fire: but if we take into consideration the other motion of the earth, viz. the alternate presenting of her poles to the sun, by the alternate rarifications of the two hemispheres, we shall see, that these motions not commencing exactly together, there can no time arrive, when both will be suspended at once; and the consequence will ever be, that these motions will not cease, unless the Author of nature counteracts their cause. I would be understood that of the two motions described, the retrograde motion from either of the poles is prior to that from the sun. And we might, perhaps, add,

the inequality of the polar gravitations to the sun, may be another cause of the eternal uniformity of these motions.

Let us try these principles once more, and apply them to the annual rotation of the earth round the sun; and if they will appear to induce this motion, we shall have completed our present task, and, indeed, more than I expected leisure to attend to.

We have already established the principles of gravitation, and shewn them to be constituted in non-resistance, (not magnetical attraction;) that this non-resistance to motion or gravitation is induced by warmth, and that this warmth is generated by the sun's light. We noticed, further, that as this warmth, or rarification, was increased while the sun was in the southern hemisphere, where the waters were more extensive; that the earth approached nigher the sun than when the sun was in the northern hemisphere, when the rarification was excited in a less degree, by reason of a diminished quantity of water: by all which it is evident I am not mistaken in regard of the true principle of gravitation. From the diurnal rotation of the earth upon her axis, there is a variation, even in the sun's latitude, of the degrees of rarification; thus the vertical point of the sun is the highest possible degree; and this degree, it may be observed, is subject to the least denotation and compression of any. Nevertheless, this very latitude becomes more or less compress-

ed, in proportion to the length of time it is absent from the sun. The same holds true of all the intermediate degrees of rarification, north and south of the sun's zenith, to those regions where rarification is in no degree induced. Now as the earth rolls east, we will suppose that the part of the globe which undergoes daily rarifications, and at the same time is subject to nocturnal compressions, must be that part which is about from forty-five to ninety degrees below the western horizon, the sun supposed to be in the meridian with us; the force of this compression would impel the globe forty-five degrees above the horizon easterly: thus the part opposite the sun, is the space of the highest rarification, and causes the earth to gravitate directly towards the sun: next, the part that last passed from the vertical flame of the sun, is sufficiently rarified to yield to the westerly compression, and is, by this compression, impelled incessantly in this immense circle it makes through the heavens.

We have, so far, marked the outlines of our new ærial system of gravitation and motion; and applied it to our inhabited globe. It must now be submitted to the reader to determine its merits, if any there be, and make up his judgment on the whole. It is presumed, however, that, notwithstanding that studied brevity and scarcity of proof unavoidable in the scanty limits prescribed, the candid reader will confess the subject is fairly treated—the evidence

pertinent; and that the principles of gravitation and motion do appear to be founded in the various properties, states and effects of the ethereal fire: that the doctrine, in all its parts, harmonizes, and most aptly applies to the rotations and motions of our globe; and, finally, that this concise system of principles is conspicuously calculated, not only to expose the vain attempts of many to explain these mysteries of nature upon principles foreign to the subject; but they may also serve as a leading clue to further improvements and discoveries in the subjects of philosophical and astronomical electricity.

It is undoubtedly true, that there is now opened to view an immense field for enquiry and investigation. All the wits and stratagems of philosophers and academicians, to substitute a system of principles whereby to explain the laws of gravitation and motion, are absolutely abortive. They have forever missed the criterion, the hinge, on which the Author of nature has suspended them altogether. How must the aspiring genius be now rallied into a contemplation of this hidden power in nature, which has mocked all the researches of the wise and learned, escaped the piercing eye of a Newton, and stood aloof to the capacious soul of De Saint Pierre; refusing to reveal herself to the wise and learned, hath finally made herself known to a babe, in comparison with others.

Wake, then, ye FRANKLINS! and, like your



predecessor, keep to the point. Unfettered, high-born republicans! unawed by the censure of critics, the puffs of coxcombs, or the scurrility of academicians, lay hold on the opportunity presented for communicating a new and complete system, whereby you will be able to explain all the mysteries of planetary and cometary astronomy: claim it as your native right. Franklin's shade beckons your attention to the subject: he led the van to the high improvement; but bequeathed the immortal honour of its completion to his countrymen. The feeblest of you all has ventured, according to a common saying, to break the ice; but the subject is in embryo. More experiments, more enquiry and application, are necessary to complete the system, and apply it generally to the systems of nature. My province is limited to the investigation of medical electricity; and I shall, after a few more remarks, submit the investigation of philosophical and astronomical\* electricity to my superiors.

From all the broken hints and scattered lights I have endeavoured to reflect on this new and intricate subject, it will appear sufficiently evident, that the great Architect of the Universe hath poised the whole conglomerated cluster of suns and systems upon this single, latent, mys-

\* The term, astronomical, &c. electricity, I have ventured to adopt, as it appears peculiarly applicable to my system. It appears evident, that henceforth planetary astronomy, as well as cometary, must necessarily involve the study of electricity.



terious agent, called electricity, or ethereal fire: that by one form of it, all the other elements are locked as in eternal ice; by another, they are again liberated and put in motion: by one form of it, a tour of flight is prepared; and by another, they are impelled to pursue that passage: by one form of it, they press towards a centre; and by another, they are compressed or repelled from that centre. But there is also a difference in the effect, depending on the quality of the matter acted upon; otherwise our whole system would be at an equal distance from the sun, or would all commence comets: For the distance of every planet from its respective sun, is determined by the degree of rarification which the sun induces upon its surface; and I have clearly shewn, that the degree of rarification is determined by the quality of that matter the sun's light is reflected upon. Also, the velocity of motion in each planet, is determined by the degrees of rarification promoted on its surface.

We have reason to believe, that all globes are composed of solids and fluids, as well as our own. It is very certain the moon is of a similar composition. An extensive liquid element is necessary to induce rotation on the axis; and this is necessary to constitute an annual rotation round the sun: For in our globe, the annual rotation has its origin in the diurnal; and, without much knowledge of planetary astronomy, I venture to affirm, from a

conviction of the truth of my system, that there is an exact correspondency between the different rotations of the planetary systems, respecting their velocity.

What shall we think now of the doctrine of our schools of philosophy? They have taught us to believe the sun is a globe of culinary fire—a furnace, like that of Nebuchadnezzar's construction. Was that the case, it would form an infinite space of non-resistance, and its whole system would gravitate to it, and be consumed. Moreover, if it was elementary fire expanded, it would need fuel to support the flame. This our philosophers well enough conceived of; and in the disorder of their theory, they tumbled comets, one after another, into his bowels, to perpetuate this imaginary kind of hell to creation, for such it must prove. At another time, they have made these comets the main transports to convey the sources of animation and life from suns to their respective systems: but, alas! what kind of suns supply this nutrition? Flaming volcanoes—millions of *Ætnas* united! We might think, were these comets of so much utility as transports, we might as well lose the sun, as lose them. But when the foundation of any theory is false, the whole superstructure will be of the same texture. The notion of a comet being heated, at its perihelion, two thousand times hotter than red-hot iron, is no less absurd and erroneous. There is no doubt but that a degree of warmth is preserved in the comet, at

its perihelion; but we cannot admit the idea of such amazing vicissitudes, especially if we suppose them to be the habitations of beings: Let us rather suppose, that as the comet approaches the sun, and comes within his repelling force, the circumambient ethereal fire of the comet is repelled from its front, which we know is the case; and, consequently, that the action of the sun's light is less refractive, or reverberatory, and induces lesser degrees of heat, in proportion as the vehicle of light is diminished. Moreover, it is certain, that if the comet was no hotter than we can heat iron in a furnace, we should not see that luminous tail, opposite the sun: Was such a heat to pervade the comet, the rarification would extend all round the comet. But this luminous appearance must arise from the effusion of ethereal fire, and must have for its focus a density in proportion to the effusion: the focus is still in the part of the comet opposite the sun. Again, did not darkness pervade the part of the comet opposite the sun, we should not be able to discover this fusion, no more than we can discover the fusions of the ethereal fire from the polar regions, called the aurora-borealis, in the day time. But how can we suppose the comet thus heated, and at the same time not illumine the regions all around it, and so destroy this density, which is known by the degrees of existing cold, or, by its light, prevent our being able to discover the illumination of its fusion?

Finally, we must conclude that there is a counterpoising power, whether we can account for it or not, that apportions means to their ends, and harmonizes all the works, laws and movements of nature. But admitting the comet is heated two thousand times hotter than red-hot iron, our philosophers might blush when they tell us of storms of hail, snow, &c. in the atmosphere of such a comet.

There are many more points of view in which I should consider the cause, the power and effect of this subtile effluvia. I would shew that the motion of the earth upon her axis, was one cause of the aurora-borealis; and the sucking of wind from a warmer region, conveyed this friction into the horizon—the cause of its not ascending so high in the summer of the northern hemisphere, as in the winter. I would further shew, that the existing degree of cold was a proof of, and the criterion by which you may know the present density of the ethereal fire.—I would prove it by the coruscations that may be induced, by stroking your hand upon the hair of some animals, in a very cold day—by coruscations that have sometimes alarmed people, when putting off woollen or flannel cloathing in a severe cold night. But I must wave all further notice thereof, until I have more leisure, and a more favourable opportunity of doing justice to a subject of so much intricacy.

We will, reader, if you please, make one use of the foregoing doctrine. Under the enlarged view in which we have considered ethereal fire, it appears, as it were, almost the Deity of nature. Was it not a mysterious instinct, that hath led so many of the untutored tribes of the earth, to pay divine honours to the sun, and even to fire, in some instances, as being of the same species? The sun appears to be, in the natural world, what God is in the spiritual; there seems to be a striking analogy existing between the natural and spiritual world. The celebrated founder of the Moravian Church, laboured successfully to illustrate this. Indeed, that teacher who came from God, taught the doctrine of the spiritual kingdom, by similitudes borrowed from the natural world. We have, in the subsequent pages, considered the sun as the consummation and infinite fountain of ethereal fire; that his very presence gives law to his whole system: what a figure this, of its Divine Author! the glory of whose presence, executes all his will; so we read, *Exodus* xiv.6, 24. "*The Lord looked upon the host of the Egyptians, through the pillar of fire and of the cloud, and troubled the host of the Egyptians.*" The presence of the natural sun produceth different effects, according to the quality of the body present; so is the spiritual Sun: His presence is a source of eternal transport to the moral soul; but to the immoral, "*devouring fire and everlasting burning.*" Again, there is a participation of the

same element as the natural sun diffused through all the natural world, by which means they are all subjected to his laws—are of animals and vegetables succoured, nourished and preserved in life; so it is with respect to the spiritual Sun, wherever there is a participation of the same nature of the spiritual Sun, throughout all moral intelligences, the presence of the spiritual Sun imparts spiritual nutrition, increase of grace and joy in God. This is the Father's cultivation of the branches in Christ; "I will manifest myself unto you;"—"if I depart, I will send you the comforter;" I will not leave you comfortless. As if he had said, have I taken care of the natural world, that the sun of nature should not cease to bestow its enlivening presence upon all the animate world that live by a participation of the same element; and will I deny the joys of my presence to those who, by the same spirit, are become one with me; no, "ye shall be loved of my Father, and I will love"—"we come unto you, and make our abode with you."

But there is a gloomy disparity presented to our view, between the natural and spiritual world; there is no exception to this participation of the element of the natural sun, throughout the whole family of animals and vegetables; they all live by this participation, and are all nourished by the presence of the natural sun: but not so in the spiritual world, or among the whole family of moral intelligences; for we ex-



perience daily what we read; "The fool hath said in his heart, there is no God;" no Sun of the spiritual world; so gross is his darkness. "They desire not the knowledge of God," there is no spiritual Sun for them. "Ye have both seen and hated, both me and my Father;" the spiritual Sun is offensive to these. But I need not enumerate passages; these are sufficient to shew, that the natural world preaches the doctrine of man's depravity, and testifies in behalf of its Divine Author, that "a man must be born again before he can see, (can *see*—a remarkable expression) the kingdom of God." As if he had said, there is no life, no animation in the natural world, but by a participation of that ethereal fire, which constitutes the sun of nature; and by which participation also, the sun of nature becomes a quickening power in the subject of that participation; so it is in the spiritual world, "except a man be born again, or except ye be baptised with the Holy Ghost and with fire (see the analogy) ye cannot see the kingdom of God;" ye can have no possible conception, not the faintest idea of the glory of the spiritual Sun; he is seen only by a participation of his likeness; hence our dear Redeemer affirms this important truth as it were by an oath, "Verily, verily I say unto you, except a man be born again, he cannot see the kingdom of God." I think we have found one text in the volume of nature, that strongly testifies the same important truth: So God and nature are



not at variance. *And we may add, it was meet the sun of nature should put on the sable mantle, when the spiritual Sun agonized on the cross.*

From a consideration of the exquisite powers, which the Author of nature hath invested in this ethereal fire, we may be naturally led to expect, at least, that there may be some extensive use made of it as a remedy of diseases in the human body. The various modes in which it may be adapted to our use, the velocity of its motion, the fineness of its particles, the pureness of its nature, the immense number of effects it produceth, the harmlessness of every effect, when carefully applied, would suggest to us, the propriety of an extensive experiment, and the probability of great success. Can we suppose that nature hath endowed this element with so many astonishing powers, that all creation is nourished and supported by it, and that none of these invested powers can be made use of in curing diseases—that we must look for no aid in this respect, but from the fugitives of nature? or is this the interdicted fruit, and all mankind filially obsequious of late? or do we, as the Jews in another case, judge ourselves unworthy of the blessing? or are we disgusted at the allegorical allusion it bears to the spiritual world, to baptismal fire, that sanctifies the soul from spiritual disease; that we will not, by terrestrial fire, purge the body from its diseases? I will here confess, that I believe the Millennium is at the door; and that this ethe-

real fire will be as conspicuous a mean of purifying the body from disease in that day, as the fire of the spiritual kingdom will be, in purifying the souls of men; and that the publication of this medical treatise, is not without the intention of Heaven.

I shall then, in good conscience, and in obedience to God, and love to my fellow-creatures, present them with a system of principles, and of practical rules, in a plain, familiar manner, whereby any man of common ingenuity may have a full understanding of the nature, properties and effects of this powerful remedy of disease, and be informed in what manner he must apply it in all cases.

## CHAPTER II.

*Of the conductors of the shock in the human body—An excessive action of the shock described—A moderate action an infallible cure of fever and inflammation—A weak action peculiar to cases of debility—Of insolation, its action a direct stimulus—Proper mode of using it, &c.*

## OF THE CONDUCTORS.

**T**O understand the manner in which the electric shock is conducted through the human body, is a matter of no small importance to a thorough investigation of the subject of medical electricity. To know whether it is conducted by the bones, muscles, fluids, or all three, is a matter of enquiry, and demands our first attention, that we may know, in general, what effect the shocks are likely to produce in the body.

Those who have been acquainted with electrical machines, must necessarily know that there is a great disparity in the aptness of some conductors, compared with others; and that the shock will incline altogether to that conductor which is the most apt or suitable.

Thus—1st. quality, metallic substances.

2d. ——— water, blood or liquids.

3d. ——— animal bodies.

4th. ——— green wood.

5th. ——— dry wood, earth and the like.

Let all these different conductors be presented at once to convey an electric shock, and the most suitable, viz. the metal, will receive and convey the whole, or nearly the whole quantity or charge contained in the receiver. Again, if you remove the metallic conveyance, and pass the shock as before, it will fall upon, and be conducted by the pure liquid element; if you remove the pure liquid element, and pass the shock it will fall on the human body, remove the human body, &c. and the shock will pass on the green wood; and lastly, it will pass, though very imperfectly, upon dry wood, dry earth, and many other the like substances; but the action could not be perceived in the human body, when these deficient conductors form any part of the conveyance with the human body, admitting the quantity is not excessive.

I have placed the human body below pure fluids, and for this obvious reason; there is a scantiness of fluids on the surface, especially at times, which impedes the motion or force of the shock, and this impediment would be sufficient to turn its flight upon pure fluids, to which it has free access.

Let these reasonings be applied to the human body, and we shall discover at once, that the fluids are the principal conductors of the electric shock; and as the blood makes the greater part, the blood doth consequently receive and convey the shock through the body.

*An excessive action of the shock described.*

To illustrate and render familiar the action of this elementary fire in passing an animal body, or the invariable effects produced thereby, we shall be assisted by observing the effects produced by an over-action thereof. Dr. Franklin's experiments having put it beyond all doubt, with those who have any information on the subject, that this elementary fire, which we call lightning, is to a demonstration the same in quality, and in the effects it produceth, as that fire promoted by the artificial machinery,\* my task is rendered the lighter. This being granted, we will draw all the information from this source that can be obtained at present, to assist in our enquiry. When a person is slain by this over-action of the shock, I suppose it may be said that they die of total atony and laxity; that is, the distensive force of the shock hath destroyed every degree of tone and tension thro'out the vascular system. The expanding, distending properties of this ethereal fire, are capable of performing this without rupturing the vessels. But its power of swelling the diameters of the vessels is so conspicuous, that it is found, by dissection, that the vessels are frequently ruptured in those who have received a large quantity from a thunder-cloud. This circumstance of the vessels being burst or ruptured, is the leading clue, by which it is easy to

\* Vide chap. 4, p. 216, 217.

discover, not only that the blood conducts the effluvia through the system, but also that very peculiar effect of the shock upon the vessels, which, if tempered by art, may be conducive of the most happy consequences: For it is incontrovertible, that if an excessive quantity of electricity is capable of reducing tone and tension, in an instant, to that degree of laxity which terminates in instant death, to silence at a touch, viz. by a violent distension, the whole vascular system, that they cannot embrace the fluids any more than an artificial tube; it follows, that was this power temporized by art, administered in form and quantity, suited to the exigency of any encreased degree of morbid tension, as in a fever, or inflammation of any kind, it must be adequate to the task of reducing that supposed tension, at the leisure of the electrician.

Another effect produced by this excessive action, is very conspicuous, and deserves our attention. This is the effect produced on the pores: this element passing in great profusion through the body, filling every part, blows open the pores, in an excessive degree, when the quantity received into the system is excessive.

It is undoubtedly true, that if a person's cloaths are dry, the whole body of fire is conducted through the system by the fluids; notwithstanding, this effluvia presses towards the surface, and through the pores, with such

violence, that any covering upon the body that is not sufficiently porous, is fractured, or blown entirely from them : this is the case with shoes and boots, through which the passage is not sufficiently free ; but it perspires linen or woollen so freely, that they are seldom or never fractured. Thus it perspires the whole body of muscles (the blood-vessels excepted) so freely, that they never appear to be wounded, unless in some very extraordinary case. But the vessels, which contain the conductors, upon which this expanding, distending element falls with great freedom, will be frequently ruptured, or burst.

My reader will please to excuse me, in noticing any occurrence that may reflect light on this intricate subject. It occurs to my mind, that one or two respectable men, who have tanned the hides of animals which have been slain by the over-action of this ethereal fire, from the cloud, told me, their skins would not make firm, impervious leather ; the pores in the skin were so expanded, dilated or enlarged, that the astringency of the bark was not sufficient to render it equally firm with other leather.

The distending, expanding, dilating properties of this powerful agent are visible in its effects every where upon inanimate substances : these I shall leave to the reflections of my reader ; and shall draw a second inference from this over-action of electricity on animal bodies.

What naturally results from the before re-



cited facts is very obvious—needs hardly any comment. Any man of the least discernment must discover at once, that this is an agent against a checked perspiration; that if administered in due degree, by the artificial machinery, must be of inestimable usefulness in fevers, inflammations, peripneumonies, pleurifies, St. Anthony's fire, and in some kinds of dropies, &c. &c. That when we compare its effects on the vessels, and in promoting perspiration, we have reason to believe that mankind will soon derive some important relief from disease, by a judicious application of this subtile effluvia.

*A due proportion, an infallible cure for fever and inflammation.*

I KNOW of no fever without tension and retention; in short, this is what constitutes a fever, and to remove these is to cure a fever. This, I believe, will be readily granted, by any one who has a knowledge of the nature of fever. It amounts to a certainty with me, that if an excessive action produces the effects described under the last head, which I think no one will deny, we have just now discovered a medicine of the last importance to mankind—a sure, a safe and an easy remedy for the most dangerous, painful and most fatal of diseases, and which have been but very imperfectly resisted by the best medical aid hitherto afforded. Electricity produceth that

very singular effect, just that which is wanted to remove fever, and for which innumerable means have been used to little or no good purpose.

Indeed, the cure of a fever, by any other means, is exceedingly embarrassed ; hence the best medical aid generally afforded, goes no further than to make some necessary evacuations, &c. Something like a mariner, who uses all his skill to navigate his vessel in a tempest, which he cannot run into a safe harbour. When we look into the nature of fever, and observe the retention of the perspirable vapour, the tension of the vessels, the diminished state of their diameters, the violence with which they embrace their fluids, their encreased laborious action, physicians are sometimes induced to tap a vein, to lessen the quantity of fluid : this will give a temporary relief, and it is but temporary ; the pores are yet closed ; the fever heat cannot be abated, unless a diaphoresis is induced ; the retained heat will bring down, in a short space, the diameters of the vessels, to embrace the diminished quantity of blood with equal violence, and all the symptoms of distress will be renewed. If we contrast the use of letting blood in this state of the system, with the electric shock, considering the effects produced thereby, we shall discover an infinite disparity in the two, a vast disproportion as to the aptness and suitableness of the one compared with the other. The dimin-

ishing the quantity of fluids is, at best, but a temporary abatement of pain and distress; doth not, in the least degree, affect the original cause, or what constitutes fever, viz. tension and retension : But the electric shock, administered in due proportion, goes to the very bottom of the cause: the elastic spring imparted to the vessels, by the flight of this dilating, distending element, being conducted through the vessels by the blood, softens the action of the vessels, by enlarging their diameters; consequently they embrace the blood with less tightness, and there is an immediate abatement of pain, &c. This, however, must be pursued to a certain degree, that is, until a free perspiration is established; otherwise the relief obtained will be but temporary, like that of letting blood; for there is no such thing in nature, as a cooler in fever, properly so called, but that which induces perspiration, or, if you please, sweating : no fever is radically cured, but by this evacuation. A fever hath its first rise in the suppression of perspiration, and those that become bilious from the same cause. To desist the electric shock before perspiration is established, would be to leave the cause of heat unremoved; and the consequence will be, that whatever degree of tension you took off by the shock, will be recommenced, and will be all of a piece with letting blood. But as it hath been demonstrated, from the over-action of the shock, that a due proportion may be found that will.

answer this purpose, either in the quantity of the charge, or the number of the shocks, there is nothing doubtful of ultimate success, wherever there is a judicious and careful attention paid by the operator.

There is little reason to suspect that a redundancy of blood, or a full habit, hath any thing to do in promoting fever; it is rather probable, that the excessive action of a fever arises from some previous inaction from languor, from some deficiency or debility of the direct or indirect kind. Fever is as frequent in a penury of fluids, as in sanguine habits; and to have recourse to phlebotomy or blood-letting, in any such increased degree of morbid action, is miserable, whether it be in fever, pleurisy, or in peripneumony. Again, in every predisposition to fever, there is more or less deficiency in the secretions, a vitiation of the humours, a coagulation of blood not duly mixed. The rarification of fever heat doth not remedy all these disorders in the system; they all call for the assistance of the electrical effluvia upon them: hence, in every point of view in which we may consider electricity, we find an increasing value in it, an increasing dependence upon it, an increasing blessedness to be derived from it. It appears to me, and I think I shall make it appear so to others before I close these pages, that had we asked of Heaven, and had Heaven granted to us one mean of health, short of miracle, we could not conceive of any thing

to answer so many valuable purposes. It is conspicuously so in the state of nature: from its properties, in sustaining, enlivening, accelerating and animating the whole animal and vegetable creation, we considered it as the soul of the universe; and when it is truly improved by art, or artfully adapted to medical purposes, it appears to transcend all other bodies, as it doth transcend them in supporting life in the state of nature.

It is too far plain to need any comment, that any medicine, agent or power, which, when administered in a great degree, is capable of swelling or dilating the vessels till they are ruptured or burst; and that a lesser quantity, duly apportioned to the exigency of tension in a fever, should not be able to remove that tension. It is equally impossible, that, in the over-action of that same power, agent or medicine, there should be such a violent pressure, oozing or blowing through the pores, as to affect the skin of an animal, as before described, or to blow boots and shoes from the legs of a man; and at the same time, a diminished quantity apportioned to the exigency of a suppressed perspiration in a fever, inflammation, cold, or whatever may cause such suppression, which should not be removed by this same agent. I think it is now made evident, and must leave a conviction on the mind of every judicious reader, that electricity is a peculiar, and an infallible remedy for fever and inflammation.

*A deficient degree only, is proper in cases of debility.*

MEDICAL electricity hath been greatly disgraced by an improper administration thereof, in many respects; sometimes by applying the shock only, when insolation was more proper; at other times, by insulating only, when the shock was more necessary; sometimes by electrifying a part, or seat of complaint, which had for its cause the general diathesis, without electrifying throughout the system, to remove that diathesis. But what hath been of a worse consequence than all the rest, is a total neglect of the patient's temperature of air; that is, to keep the patient from every the least degree of coolness during the operations of electricity, and for several days after the operations of electricity are desisted. But what I mean particularly to reprobate in this place, is the impropriety of strong shocks in cases of debility. There will be, however, a temporary sensation of debility experienced from the continuation of the lightest shocks; inasmuch as the most gentle electrifications will, if continued, attenuate the fluids, promote perspiration, and, by a kind of rarification, or frictional heat, propel off air contained in the blood-vessels, and in every part of the system; by which means, all the vessels become less distended, and consequently, a sensation of languor is experienced. This, however, is no argument against the propriety of using electricity in cases of debility; for not-



withstanding this seeming debility, the ultimate termination of the process is, the system is purified of vitiated humours, the secretions are accelerated, and the digestive powers are invigorated, and an appetite for food is the common consequence; and, by this process, more food is taken and digested, more nutriment is supplied to the system, and the vessels are replenished with vital stimulus, and the whole system is thus invigorated. But the over-action of the shock is much to be dreaded in cases of debility. What this over-action is understood to be, hath been before explained; it is a reduction of the tone and tension of the vessels in particular: there is an equality of tension on the whole muscular solids undoubtedly; but the over-action of the shock is experienced in the vessels chiefly. If the shock is sufficiently strong to spring, to distend or dilate the vessels, it weakens and diminishes their power of propelling on the blood contained in them: hence if the circulations are already too languid, it is madness to add to their degree of languor, which hath been the case ten thousand times, and hath been one cause, among many others, of keeping medical electricity in disrepute, almost from the first discovery of it. But as the peculiar effects produced by the shock are now clearly understood, it is hoped that these improprieties will be avoided in future.



*Of Insolation.*

THIS subtle electrical effluvia, or elementary fire, hath been considered as the principal agent of the animal and vegetable life; that its action was a direct stimulus; that a deficiency of it, which is sometimes caused by heat, endangers diseases of debility; that in this deficiency, however, is founded the laws of gravitation and motion; and that the laws of nature were so arranged, that temporary supplies should be occasionally imparted, in such a manner and degree as not to impede the laws of gravitation and motion on the one hand, nor suffer animal and vegetable life to perish on the other. We come now to the consideration of the artificial supply of this ethereal fire, and the investigation of its effects. Seeing this element is evidently the grand principle of animal life, and we have, either by the interposition of Heaven, or by a miraculous stretch of human genius, or simply by good luck, obtained means of converting it to our use in many forms, it would seem, as I said before, that if art hath any thing to do in improving nature, common prudence would suggest that we no further neglect to improve, for our use, the most essential mean of health to be found in the universe, nor spend our labour and skill upon (comparative) insignificancies. Not that I mean other medicines should be neglected: many of them are, and undoubtedly always will be, necessary to the cure of diseases. But what I mean is, that there are

already a sufficient number of valuable medicines discovered, to aid electricity in the healing or preventing nearly the whole catalogue of diseases; and that electricity hath been neglected, to the great detriment of mankind. I am not, however, of the opinion of some, that this hath been a wilful neglect, fearing lest it should become too familiar; that every one would be in possession of so great a mean of health, that the faculty would be injured thereby. Every consideration that hath induced me to publish this treatise, stands opposed to that idea: I know that medical electricity hath never been understood; that the subject is very occult; that thousands, in all probability, yea, undoubtedly, have gone about the business with an intention to do their utmost with it: But the administration of it requires such minuteness of skill, and this hitherto to be obtained only from long practice, that many, before they had acquired that necessary skill, have flung by the whole business in despair, or only used it afterwards for a pastime. I have known physicians to die of diseases, with their machines by them, of which, had they understood them, and known what is now known, they might easily have cured themselves. So I conclude, that had physicians absolutely known the medical use of electricity, and been cruel enough to refuse it to their neighbours, they would never have refused it to themselves and their families.

The artificial insolation is not yet fully un-

derstood: The most that can be said is by way of inference, from the consideration of its being naturally, or in the state of nature, the animating, quickening and sustaining principle of life and motion, and from the trifling experiments that have been as yet made with it. I say trifling experiments; for the greatest continuations of insolation have been but short. The artificial insolation produceth no effect longer than during the time the person is upon the insulating stool or stand: as soon as he steps off that stand, he loses the plus electrification; he is on an equilibrium with those substances he stands connected with. What if an opiate should lose all its effect in that short space of time which people commonly stand electrified? It would soon lose its high estimation too. The artificial insolation, or filling the body with this elementary fire, discovers itself in several particulars; such as an acceleration of the circulations, warmth, and, when carried to a high degree, a vertigo, or swimming in the head: This vertigo is undoubtedly formed by a redundancy of blood, flung into the head by the sudden action of the vessels. A few smart shocks passed from the sides of the neck to the feet, will immediately remove this disorder, by softening the action of the vessels in the lower extremities, and then the insolation may be continued; or, in a weakly person, it would be best not to carry it so high, or, to remedy it,

to pass the shocks from the hips to the feet only.

The sensation of warmth experienced, is the effect of the insolation, and arises from the acceleration of the circulations. It is found by experiment, that the pulse is quickened two or three pulsations in half a minute. This acceleration of the circulations cannot arise from any degree of tension that might be supposed to be induced in the system, because it is almost instantaneous with the first insolation; wherefore, it must arise from a cause independent of tension, or at least any suddenly-increased tension. It is undoubtedly occasioned by the operation of this active principle of life on the fluids independent of the vessels. It is the inseparable property of this effluvia, when attached to light bodies, to repel them asunder by the globular atmospheres condensed around them: thus when this supernatural quantity is added to the natural (the natural itself being active) the supernatural, or artificial quantity encreases the action of the natural; by stimulating the globules of blood with higher and more active atmospheres, filling the vessels, buoying up the fluids, they flow with more freedom and vigour, with the same exertion of the heart and arteries, the same tension of the vessels.

Thus, the operations of the artificial, or supernatural quantity, prove my hypothesis concerning the natural quantity, to be true, viz. that this elementary fire is the soul of the universe,

the all-sustaining, animating, pervading principle of life and motion in the animal and vegetable creation: and the operations of the natural quantity prove, to a demonstration, that the artificial, or supernatural quantity supplied by art, is an additional supply of the vital principle of all animation and life. But here may arise a question—May not the excitement of this artificial insolation be carried so high as to induce indirect debility? To which I answer, it is not likely that any considerable inconvenience would arise from a high and lengthy insolation, especially if the vessels in the lower extremities were once in a day or two slackened in their action by a few shocks sufficiently strong for the purpose, to prevent vertigo: moreover, the encrease of the natural quantity, from summer to winter, is an encrease of health and vigour; and the continuation of this density of electric fire through the cold season, is a continuation of health, and lessening the number of diseases among mankind. In a high state of artificial insolation, there will be promoted a perceptible perspiration; so that I cannot discover that it forms any kind of predisposition to fever or inflammation. This element we call fire, when expanded, is in an undisturbed state, far from what we call warmth; it is only capable of firing combustibles in the instant of its expansion.—You may charge a cask of powder, or a glass of rectified spirits with this fire, and it will pro-

duce no visible effect; but if you expand the element, by taking off a spark, it will take fire or flame. This element is itself cold, but by its activity on the animal life, produceth warmth: it is dissimilar to all other things in nature, and we cannot conceive that any degree of it is dangerous, merely because other stimulants in great degrees are dangerous.

*Insolation a direct stimulus.*

FROM all that hath been said on the subject of insolation, it is manifest enough, that it is a very diffusive, active stimulus; that it hath an instantaneous effect on the circulations, in quickening and invigorating the animal powers; and, as such, it may be denominated a direct stimulus.

From all that I have been able to ascertain of medical electricity, in more than sixteen years practice, I have denominated a strong action of the shock to be a direct debilitator; the action of very weak shocks, to be an indirect stimulus; and the action of insolation to be a direct stimulus. A very strong shock abates the vigour of the animal functions, and may reduce them to instant death. Some would have this called indirect debility; but as there is no space of time between the first action and the debility, I think it is more properly denominated direct debility. The electric shock, in the lightest degree of it, cannot be considered as a direct stimulus; for if the light-

est shocks are frequently repeated, they induce a temporary sensation of debility, in the manner before described; but they may be considered as an indirect stimulus; for, inasmuch as a continuation of the gentle electrification induceth warmth, this warmth has a tendency to induce tension and vigour. Moreover, the digestive powers are assisted directly by the operation; and so the system becomes invigorated by a kind of secondary cause; wherefore I have given it the name of indirect stimulus.

But filling the body with this elementary fire, produceth an effect quite different to any other mode of application. It operates something like an opiate, but more suddenly, and affects the system differently: an opiate accelerates the circulations, by inducing tension on the vessels; but this ethereal effluvia, by affecting the fluids primarily, and the vessels secondarily, as hath been already described.

It is evident from every consideration of its effects, that it should never be used in any state of increased pulsation, or morbid excitement. It is equally evident, that it is peculiarly useful, and ought ever to be used in cases of deficient excitement, languor of pulsation, feebleness of body, coldness, and to prevent the periodical return of an ague, &c.

This stimulus being so harmless in its nature, so operative in its application, calls for more attention, methinks, from the gentlemen of the faculty.



*Proper manner and means of insolation.*

NOT only the shortness of the time, but also the weakness of the degree, have both conspired to render insolation a mere insignificancy. It hath been observed before, that the plus electrification ends with the persons stepping off the insulating stool or bed, &c. The person is reduced to an equilibrium with those substances with which he stands connected; he retains no more than his natural quantity, and the supernatural, or artificial, ceases to produce any visible effect; especially when it hath been continued but an hour, or perhaps not half that time, seeing it doth not immediately induce tension of the vessels; and if it doth produce that effect in any degree, after long continuance, which is not fully proved, it cannot be expected that a short insolation should be of any considerable importance. It remains, then, that in order to ascertain the utmost benefit to be derived from this source, there should be a continuation of the insolation for days, weeks, or months, as the case may require. There is reason to believe that cases of deficient excitement may be relieved by such a process, in a manner most agreeable to nature; it is that mean of excitement, that criterion of life, that source of animation, on a competent supply of which is suspended all animal and vegetable life. When a deficient excitement is restored in this manner, it is done in perfect conformity to the laws of nature. There can be no di-

rect debility, but what must originate either in a deficiency of this ethereal fire, or in too much abstinence from diet, &c. And I am most apt to believe, that the debility doth generally originate in the former; and that if the debility should be found to have its source from that cause, we may be enabled to discern the cause of so much embarrassment in restoring diseases of this description by tonics, by diffusible stimulants, by the more durable, &c. of food, during the hot season, or while the natural quantity of this ethereal stimulus is deficient. Is it not evident, after all, that the patient must generally wait for the completion of the cure, till the cool season returns? that is, in short, till common air is again replenished with an increased quantity of this pure, this salutary, this universal, unfulled principle of all animation and life; and it is almost in vain to attempt any substitute for this agent of life, when it is evidently deficient in its natural quantity or quality. So necessary is this element to life, so exquisitely adapted to the very existence of the animal being, to say nothing of the vegetable, that nature refuses to own its rival—cannot find an ample substitute in all the productions of art. In short, this is what Infinite Wisdom hath produced, as the criterion of life, throughout all nature; and I had almost said, Infinite Beneficence hath condescended to inspire an Ottoguericke, a Cuneus, a Franklin, &c. with wisdom to invent

an artificial mean of supplying a deficiency of this principle agent of life, whenever, and in whatever form we can desire. But as the discovery and improvements in the artificial machinery have been progressive, and understood by little and little; so also have the discovery and improvements in its medical qualities been progressive. Electricians have not been so completely skilled in electricity as they may have imagined, especially in administering the shock. Monstrous improprieties have generally attended, and generally defeated their hope of success in removing diseases by this subtle effluvia. Insolations have been commonly so short, that if they were used, even in cases of excessive excitement, there could be but little harm done; and they have been so short in all cases, that they could be of but small use.

Seeing, then, it has now become possible to restore nature in the very part wherein she is deficient, and in which diseases generally originate, by a continuation of the artificial insolation, we have it now in our power to afford a new and salutary aid in several cases of deficient excitement. This source of medical aid, however, involves in it considerable cost and inconvenience; and it is not expected that it will be generally adopted. Those who have leisure and abilities, may use it to great advantage, in lingering diseases, or as a preventative of diseases in the hot seasons, when the natural insolation or quantity or quality of it is defi-

cient. But I shall have occasion to say more on this part of the subject, as well as of using the shock, when I come to treat of the practical rules, which I shall exhibit from an extensive process of experiments in the course of sixteen or seventeen years. I suppose that it is so far made obvious to every judicious person, that great benefit may be derived from the artificial insolation, that those who have leisure and abilities will be induced to put it to actual experiment. For the benefit of such people, I will say something of the proper means, or construction of the machinery. In doing this, however, I do not mean to give a receipt for building electrical machines in particular, in this place; but only to shew that the machinery ought to be largely constructed, the wheel three or four feet in diameter, with a good cylinder—a receiver that will contain eight or ten gallons; one of this size will continue the insolation a long time: every part of the metallic substances in the machinery must be rounded and smoothe, nothing pointed or edged in any part; the same must be observed in building the insulating stand or bed; any thing edged or pointed, will throw off or dissipate the fire, and you cannot carry the insolation high, nor continue it but a short space. There must also be a fire kept in the room, to keep the air dry, otherwise it will fall upon the glasses, and prevent their charging. The person insulated must not have pins about him

with the points sticking out, nor any kind of pointed metal; it will likewise dissipate the effluvia, and prevent their charging or retaining a charge of insolation. These are the principal things to be observed in order to effect a degree of insolation that may be expected to avail any thing worth attention.

There is another method which might answer as good a purpose, or better, on some accounts: it would be attended with more cost in the first instance, but with less trouble in the using. I mean to construct the works in such a manner that the cylinder or globe should be turned by the assistance of a water-wheel. This might be done on a small rivulet of water, as a very little would answer the purpose of turning the cylinder, with a good construction. It would not be good to erect it nigh a mill-pond, or any large body of water, as the dampness and exhalations from stagnant waters would be injurious to the operations of the machinery, and unfavourable to the health of the patients attending.

As the intention of this construction would be, in the hands of a physician, to treat cases of great and obstinate debility more effectually, one such construction would be sufficient for one county. I doubt not but that a skillful electrician would find a mutual advantage arising to himself and to the public, in properly considering this new branch of the healing art. This construction would answer all

the purposes of those that are turned by hand, both in insulating and giving the shock. The physician would have his patients under his daily inspection and care, to vary the operations as he saw proper; to administer any other aiding medicines, as he might see needful; and to govern the regimen, but especially the temperature of air; that his patients observe one steady invariable degree of warmth: this is something difficult to learn. I have always observed that people could not readily conceive of the extreme minuteness of attention which it is necessary to observe, when under the operation of electricity, especially the shock, to prevent taking cold, or checking the perspiration: the greater part must learn it by actual experiment; and even then they will not suspect that electrifying was the cause that exposed them, unless they are cautioned to expect it. Whoever wishes for success in administering electricity, must pay all attention in this particular.

Such a construction, in the hands of a judicious physician and electrician, would soon become popular: its extreme usefulness would court the attention of mankind, and draw increasing numbers to it, as to an inestimable resort for life and health. Thousands that resort to Ballston, Saratoga, and other mineral waters, yea, and with diseases of deficient excitement too, would, in process of time, learn to avoid those debilitating waters, (excepting what may

be necessary as a purgative) and resort, for the cure of diseases of debility, to this fountain of supernatural insolation—this all-quickenings, expanding, vibrating, animating, pervading, sustaining principle of life and motion. There will be a consistency in these means for cure of deficient excitement, viz. the insolation to stimulate and promote action and velocity in the circulations; and this indication, alternated with a few gentle shocks, to promote attenuation and a due mixture of the secreted and circulating fluids, and to separate and carry off the retained humours.

In spite of all the neglect with which the subject of medical electricity is treated by physicians, and the world of mankind in general; in spite of all the buffoonery and contempt, malice and opposition, which some of the faculty discover to a character that patronizes medical electricity, (a subject into which, however, they will not enquire) there are some European writers who have acknowledged, that electricity doth produce the above described effects on the human body. Some of these electricians have made considerable improvements, of late, in the art. It was with regret that I observed the latest and best of these writers, viz. Cavallo, to be so far short of a thorough investigation of the subject, as to make it necessary for one, whose abilities in other respects are not equal to the task of arranging and treating a subject in a learned and methodical



form, to attempt a subject so occult and intricate; and, from circumstances which have ever passed the observation of electricians, to produce the leading clew, and establish the subject on its true, genuine principles. I have not attempted to be "wiser than seven men that can render a reason:" I have demonstrated it, to the capacity of boys, that electricity, artfully dispensed, is an infallible remedy of fever and inflammation; and, in producing this effect, must necessarily effect several other valuable purposes. I have demonstrated the probable utility of the supernatural or artificial insolation; and made it apparent, that we may reasonably look for great relief in cases of deficient excitement, whenever there shall be a reasonable and judicious application thereof made in such cases.

I could wish that I might, with propriety, now drop my pen, and close the subject; that the operator might at once infer the mode of treatment proper to fever, and all other cases in which electricity is useful. But as this part of the subject of administering is likewise embarrassed, and cannot be always readily discovered, it makes it necessary for me to take that part of the business into consideration, and treat of the mode of administering electricity, peculiar to the several diseases in which it is proper, and describe that particular manner in which the disease is affected thereby, that the physician, or operator, may be able to judge what other means will be necessary to accompany electricity.

## CHAPTER III.

*Containing practical rules for administering medical electricity, in several cases—formed from a process of experiments.*

## FEVER.

**I**N whatever habit, or from whatever cause fever may originate, I suppose it will be granted, briefly, that fever doth consist in tension and retension; that this is what constitutes fever in all and every person, of every age and in every clime, whether it is termed nervous, bilious, intermittent, remittent, &c. they are but terms to express different circumstances, or different manners in which the subject of fever is affected by tension and retension. This being granted, we will proceed to the application of the infallible remedy of tension and retension, as it respects several important circumstances.

When the operator comes to his patient, he must inform himself of the peculiar circumstances of his patient; notice the habit, strength, &c. peculiar to the constitution. If a woman, and pregnant, all these circumstances will require minute attention, and a different manner of treatment—if the fever is bilious, and the stomach is much exercised therewith, it will be necessary to administer an emetic, prior to electricity—if costive, a cathartic may be given at the instant of commencing the electrical

operations; and the shock will accelerate its operation. These precautions being had, proceed in the first instance to take off the tension in the lower extremities in the first place, by passing shocks from about the hips to the feet obliquely, that is, from the right hip to the left foot, keeping the legs apart. If it be a strong constitution, and not a woman pregnant, the shocks may be passed in this direction very strongly, or so strong that the patient may perceive the motion of the shock nearly the whole distance, that is, from one chain or wire to the other, or from the hips to the feet: six or eight shocks being passed in that direction, shift the chains contrariwise, and pass as many down the opposite side.

This operation is performed with all safety, and will soon abate the action in the whole system; by enlarging the diameters of the vessels in the lower extremities, and opening the pores, the blood will incline towards this relieved part, and ease the head of pain, and in a little time will recover from delirium. It is very expedient to conjoin with this operation woollen or flannel cloths, dipped in hot water, and wrapped about the feet. It helps greatly to promote perspiration; and when the shock is applied to the whole body, it is useful to dip a fire-brand in water, and, with flannel wrapped round it, apply it to the patient's back or sides. The patient must also drink freely of some hot, fermenting herb tea, till a free per-

spiration is induced. Wait, if you have leisure, fifteen or twenty minutes after the first operation; then proceed to pass eight or ten shocks from the right hand to the left, so strongly that the patient may perceive the motion of the shock in the shoulders or above the elbows, or perhaps in the breast, if there should be no particular weakness there, which is sometimes the case, and might receive injury by too strong a shock on the part. Indeed, whenever you take a new direction of the shocks, the first should, in all cases, be light; and as you increase their strength, you must do it by consulting your patient's sensation of the shock; and take care not to wound any particular part by an over-action of the shock, nor reduce your patient too fast, nor too low. Also, trembling and faintness will sometimes occur, especially on the first electrifications: all which occurrences and circumstances must be looked for and observed, and remedied—sometimes by desisting the shock for a time—sometimes by an internal stimulus, &c. &c.

After eight or ten are passed in the above direction, let twelve or fifteen be passed from the sides of the neck to the bottom of the feet, of about the same strength as the former; of which you will be able to judge by your electrometer, which I have described, (vide chap. I, page 27—28) where it is said that the distension of the balls is in proportion to the degree of the charge, &c. It is necessary that

every operator know the quantity contained in his receiver: This is easily done, by observing the distension of the electrometer, in different degrees of it, and then experiencing the shock in his own body. Although your patients must be consulted, as before mentioned; nevertheless, you will find some of them that will complain before they are hurt. A light shock will give a disagreeable sensation in the joints, and some other parts, especially where the chains are applied. Thus the operator will be obliged to use his own judgment sometimes, as well as to consult his patient's feelings, &c.

These operations—this number of shocks, may possibly promote an universal diaphoresis, in a degree; but, after a few hours, it may be, and generally is necessary to administer as many more. Of this you must judge by the habit, by the state of the pulse, by the ease and quietness of the patient. If the perspiration is rapid, in full flow, you may desist the shock, and expect the symptoms of disturbance to subside more and more. But, at all events, if the patient can bear it, these operations must be persisted in, and repeated once in two or three hours, till the tension is taken off, and perspiration is in full flow; and the shock must be assisted by all the means before directed, or some others that will answer the purpose.

The time of keeping up this full flow of perspiration must be longer or shorter, according to the fullness of the habit, or till all pain, rest-

lessness, &c. are totally extinguished, and the pulsation calm and easy.

If there should be any difficulty in removing pain from the head, a few light shocks, brought on to the forehead, or back part of the head, as the seat of the pain may be, and passed to the feet, will commonly give relief when the other directions will fail.

There will not always be the same immediate relief gained; and there will be much variation as to the number of shocks, as well as their strength, required in various constitutions and degrees of the fever.

There are some happy consequences attending the treatment of a fever by electricity, which are not always sure to attend a different treatment; some of which are, there can no kind of swelling generate where the electric shocks have been lately passing; there can be no tumefactions, ulcers or abscesses, nor cause of them, remaining in the system, or they are certainly dissolved by the shock repeated upon them, unless previously matured; in which case it is difficult, or utterly impossible. The most that can be done in such a case, is to restrain the inflammation, and shorten the crisis of suppuration, &c.

Many are the disasters which happen to people in the progress of a fever, under any other treatment; all of which we may, with the greatest certainty, expect to avoid, in treating



with electricity in manner and degree suited to the exigency of the case.

In treating fever by electricity, in constitutions more infirm and delicate, the operations must be made in a milder manner and degree; the shocks must be passed in the same directions as before described; the tension must be taken off in the lower extremities first, (except in pregnant women, which circumstance will require a little different treatment:) there is less danger of inducing disagreeable sensations, such as faintness, trembling, &c. The system will be greatly relieved, without passing a single shock upon the vital part. It is prudent to give a very weakly person all the relief possible by this first operation. It will sometimes be necessary to administer a dose of *elix. parag.* or diluted opium; or, if you please, in substance, to keep up the vital strength of the patient, after a short evacuation by perspiration.

It may be observed, that the weaker the constitution of the patient, the less will the tension of the fever resist the operation of the electric shock. The lesser quantity, then, will produce the same effect on a weak person, a child, &c. that a larger quantity will upon a sound, strong man. A shock that would scarcely take off any degree of tension in a strong man, would reduce a weak man, even in a fever, greatly below par. The operator must, as was said before, be acquainted with his own machine: He must observe the different degrees of the



charge by the electrometer—must notice how well people are affected by them—must notice what degree will be felt in a well man, no higher than his wrists, when the shock is passed from hand to hand through the breast—what degree by the electrometer will jar the same man to his elbows—what degree will affect him to his shoulders; and, lastly, what degree will jar him in his breast.

This last is the highest degree that should ever be administered: It is hardly ever necessary, even in the highest degree of tension, in a strong man; it may as well be performed by an increased number of weaker shocks, which are much safer and easier for the patient.

I have frequently observed, that a shock which could be felt in a strong man, or woman, no higher than the wrist, would jar a weak person smartly in the breast, and would be almost the over-action of the shock in them.

Let the degree of the shock be what it may, if a person feels hurt in the breast with it, he is hurt indeed; it is the over-action of the shock to him. Hence we infer the absolute necessity of commencing the operations in a reduced degree; and that they be increased, partly by consulting the patient, especially if a delicate one, and partly by the operator's absolute judgment. In case of pregnancy, the shocks must not be passed obliquely, but passed from about the hip joints to the foot on the same side, and that but lightly; the legs must

not lie together, lest the shock should take a circumlocution, and pass partly on to the opposite side and may, especially in a weak person, endanger abortion. I think there would be much danger in passing strong shocks through the uterus; they would, undoubtedly, prove fatal to a delicate habit. Light shocks may be passed in great numbers from right hand to left, across the breast, and from the sides of the neck to the feet; but these last must be almost imperceptible; they must not be perceived to jar the patient in the body. However, as there is an increased tension or stricture upon the vessels, there can be no great danger in reducing that tension to the same degree of laxity which existed before the fever, if it is done moderately. I have had occasion to use it on several women, in all stages of pregnancy, and have never observed any ill effect produced by the shock in such cases. I had occasion to use the shock on a woman in the yellow fever, at New-York, the wife of Abraham Bower, Washington-street: she was in a very high state of inflammation, and of a firm, compact habit: I gave her great numbers of light shocks: in the course of two or three days, she was relieved from the first operations of them from pain; in a few hours an universal diaphoresis was promoted, and kept up about two days, by which time she was nearly well. I think it was the fourth or fifth day after I took her under my care, that she cooked gammon

herself, and ate freely, without receiving any injury thereby. This was about the last of September, 1798. Mrs. Bower, however, could hardly believe that those little insignificant shocks should be so instrumental in her cure. Doctors in the city had the same instruments, and did not use them scarcely in any case: I was from the country, and cut no popular figure; in short, the lady did not know what to think of this new fashion, but was willing to own I had cured her very suddenly, and was a good nurse.

The fever was on the decline when I came to the city, being the last of September, so that I had but a very small opportunity of introducing my new and infallible remedy of fever. While I was tending on Mrs. Bower, I was called to a woman near Bear-market, I think a kinswoman of Mrs. Bower; she was suddenly taken of a fever (but not pregnant;) I gave her a smart electrification, and directed the nurse to pursue means of promoting a deep sweat: it was done; the next day I called to see her; she was setting up, and comfortable, and was directly well. I was next called to a woman who had nursed a man, called Cootong (but spelled differently) a shoemaker, nigh Teawater pump, who had just died; she was much affected in the pleura; but a single electrification restored her, with a few other simples. By advice from Dr. M'Lain, I went to Bellevue hospital, where I relieved a few convalescents.

A German, called Christian Pineroot, who was employed in one of the sugar-houses, was brought sick of the fever, but not very bad: I administered electricity freely, and the assistant means; he was restored immediately: the third day, early in the morning, he absconded the hospital, without any discharge; I returned his name to Dr. Bailey, who had not seen him. I used the shock on one more, a young man just arrived from London; he was brought to the hospital extremely bad, exercised with excruciating pain in his head, &c. With the electric shock I gave him immediate relief from pain; but as I directly left the hospital, without pursuing it till I had sufficiently taken off the tension, and induced perspiration, I know not how it terminated with him. I have taken the liberty to make these few brief statements of facts, that the citizens may, if they please, inform themselves of the truth of them, in some instances, at least. I shall now close this paragraph, by observing that the most strict attention must be paid to the patient's temperature of air, or rather an exclusion from air, from every the least degree of coolness for a number of days after the operations of electricity are desisted. After a sufficient evacuation hath been made by sweating, the degree of heat must be moderately abated, but not to admit of the least coolness; for this purpose a very careful nurse must attend the patient in sleeping, lest by accident the covering be thrown

off, and the patient take cold, which would at least be hurtful, if not endanger life itself. There is no possible case in which it is so difficult to guard against checking the perspiration, or taking cold, as in that of electrifying till perspiration is induced; and, indeed, without even making that perceptible, there is need of particular caution. Being thoroughly convinced that the success of the operation depended very much on the faithful attention of the nurse, and the difficulty of persuading them of this truth, I have ever made it my care to observe their conduct in this particular; or when I could not trust to them, and had leisure myself, or when the repute of medical electricity was suspended on the case, as in that of Mrs. Bower, I have taken the whole business on myself, and have generally had the best success when I have so done. The physician will now understand that electrifying in a proper manner performs nearly every part of the cure, excepting what is performed by emetics, cathartics and tonics. Electricity ought to be used in the first stages of a fever; the patient is better able to bear the operation: if it is neglected in dangerous fevers, some part essential to life may be so impaired or wounded as never to recover by any means. It should be used early in the yellow fever, such as hath prevailed of late at New-York, Philadelphia, and some other places, to reduce the action of the heart and arteries, before their enginery, by pressing too

strongly upon the capillaries, causes them to uncap and emit blood. It is in vain to administer the elix vitriol, or any other astringent in this case, unless they could affect the capillaries only; but while they increase the cause, as much as they militate against the effect, to say no worse of it, it is useless. But to take off the tension of the vessels, this is going to the bottom of the cause, and there will be no emission of blood in fever, or peripneumony. There is no doubt but that the attenuation of the blood by rarification renders the increased action of the arteries more capable of producing this effect. But there is no emission of blood, simply from attenuation of that fluid. There is always some other cause co-operating, as the increased action of the vascular system, in whole or in part, or some extravasitation of the blood.

### *Peripneumony.*

THIS inflammation of the lungs, which is local in the first instance, but becomes universal in its ultimate process, and hath its first rise in the general diathesis, should be treated by the electrical shock, as fever in the first instance: That is, the diathesis should be removed in the lower extremities in the first place. The sthenic diathesis being taken off in the lower extremities, by the distensive dilating effect of the shock, and the perspiration promoted there, will cause the blood to draw off from the chest, and relieve the action of the pulmonory vessels.



sels, and give relief in the lungs. This case, as well as the seat of inflammatory rheumatism, demands a delicate treatment; the highly irritated state of the lungs will not bear the most imperceptible elastic spring of the shock; indeed, the least shock is so far perceptible that it apparently wounds the lungs; but there is no necessity of passing the shock through the lungs, until they are so far relieved by removing the general diathesis, by shocks in every other part of the system, that they will begin to receive light shocks freely; and they may be increased in strength from time to time, without any perceptible alteration in the patient's sensation of them: for as the lungs are more and more relieved, the shock will be less and less perceptible in the lungs; which will be one criterion whereby you may judge of the degree of betterment. If the patient's habit is very sanguine, the cure may be facilitated by bleeding: the cure, however, may be absolutely wrought without bleeding in all cases, and it would be an error to take any part of the vital fluids, where there is evidently a penury of fluids, whether it be in pleurisy or peripneumony: but as there will be no necessity, since electricity is now understood, of letting blood, merely because there was no alternative, the physician will not now be driven to the extremity of choosing the least of two evils, but will now only let blood when



the patient can well enough spare it, and facilitate the cure thereby.

The shocks must be passed from the hips to the feet obliquely, as for fever, in the first instance; but may be increased in their number, or frequently repeated. In the next place, bring the chain from the hip as high as the pit of the stomach, and opposite the stomach on the sides and on the back, and pass twenty shocks in the several directions down to the feet: next, pass four or five from the shoulder to the hand, on either side. Soon after these shocks are passed, perhaps in one hour, the patient will begin to bear them through the lungs, in which direction their strength may be gradually increased, till the whole disturbance is entirely removed. But it must be remembered that the same means prescribed for fever, to assist in bringing forward a flow of perspiration, must be made use of here, and indeed in all cases of increased excitement, and kept up till the desired effect is produced, or so far as can be produced by this evacuation; in peripneumony, internal evacuations are frequently necessary, especially by cathartics; in which case, glauker salts are esteemed proper, in the most of cases.

Perhaps, by often repeating the caution, I may be heard: keep your patient from every degree of coolness for several days; be exceedingly careful in this particular, or all is overthrown, and you will destroy your patient:

not only so, you will still keep mankind from the knowledge of its use, and thereby indirectly take away many lives, and leave many to languish in pain and misery.

The operator, whether a physician or private character, will understand that it is expected that the electric shock, duly administered, will perform the principal part of the cure : a single dose of glauher salts may be necessary. If bleeding might be proper, and no physician can handily be had, it may be supplied by continuing the perspiration a longer time, and by reducing the tension of the vessels more and more, and their action will grow more moderate, till health is obtained, without letting blood.

### *Pleurisy.*

THE symptoms in a pleurisy being considerably different, they will require a different mode of treatment, both in the manner and degree of the electrical operations.

When the pulse is high, with a general inflammation and a suppressed perspiration, the shock must be passed in the same manner as for fever ; but the shock must not be passed through the affected part of the pleura, till it hath been previously passed in all other directions. The irritated part of the pleura is to be considered as the lungs in a peripneumony, incapable of receiving the shock, till relieved by a previous operation in other parts, which,

in the case under consideration, includes not only the fermentation of the fluids by the shock, but also that compression which is formed by a suppressed perspiration. After all the abatement of the symptoms is made that can be, by fermentation in other parts, and by removing the suppressed perspiration, let the shocks be passed directly through the affected part of the pleura, from side to side, beginning, as in peripneumony, with very small shocks, and increase their strength as the case may require, or as the patient is able to bear. It frequently happens, that the pain will move from place to place ; but it may be observed, that it will move in the same direction in which you pass the shock : for instance, suppose the seat of the pain to be in the right side, your proper method will be to pass the shock from the right side to the left ; if the pain takes a different seat, it will be towards the left side ; if it moves quite into the left side, then turn the direction of the shock from the left to the right side ; and you must continue to make these different directions, as the seat of the pain may be : if the pain rises towards the shoulders, then turn the direction of the shock directly down upon it, &c.

I have given fifty shocks, in different directions, before the patient could move an arm, or incline the head ; but by the time I had given fifty more, light ones, they have been able to rise and walk the room, being warmly covered.

If the irritation hath remained some days in a particular part of the pleura, it will be so exceedingly weakened and wounded, that the pain will incline to that part, in preference to any other ; the blood, wind, &c. will continue to distend, and irritate the feeble part : in this case, the shock should be passed once in half an hour, or nearly that, as the pain may chance to increase in the part ; this will give the dilated part temporary relief, and enable it to recover its natural tone and strength in a short time. But sometimes there is a violent pleurisy, and with it a voluntary perspiration ; or at least, there will be no symptoms of perspiration's being suppressed—no evidence of sthenic diathesis being present, but evidently asthenic. In this case, a general fermentation of the blood is all that is necessary to be effected. It is owing to some stagnation of the blood, from the grossness of its particles ; to attenuate these, and throw them into circulation, is the whole indication of cure ; this may be effected by electrifying throughout the whole system, but especially through the sides, as strongly as the patient can bear, without being wounded thereby. It is often necessary to repeat the shocks three or four times in one day. The oftener they are repeated, the less number is generally sufficient. It is sometimes necessary to administer a purge, but very seldom an emetic. I have observed cases, in which an emetic is absolutely necessary ; yea, death will

be the consequence of withholding an emetic : but this has its rise in the stomach ; the pain commences there, by reason of accumulated sharp crudities, that irritate the region of the stomach, and by-and-by a sympathy strikes the sides : the doctor is called to a pleurisy ; he lets blood, but to no essential purpose ; it must abate the sympathy in the sides, but cannot affect the cause. In one case of this description, I was called ; but all means were baffled, even the electric shock would only abate the sympathy in the sides for a few minutes ; but as soon as a puke began to operate, the whole disturbance subsided. I have known but of one other case just similar : A doctor was called, at a late stage : he drew blood for a pleurisy ; it availed nothing ; the person expired in great agony in a few hours after bleeding.

### *St. Anthony's Fire.*

THIS disease is attended with a total suppression of perspiration, equal to any retension in fever heat. It may be totally cured by electrifying ; but it will be assisted by purges, &c. The method of treating by electricity, is to electrify freely throughout the whole system, as strongly as the patient can well bear ; and this must be assisted by all those means prescribed to assist in promoting a rapid flow of perspiration in a fever ; this must be kept up until perfect relief is obtained.

If the head is much affected, it must be covered, and the shocks passed from all parts round about the head, to the feet; this will promote perspiration in the head also, it being covered warmly, and will soon throw off the whole affection in the head and body. The covering on the head must be left off by little and little, or a cold will ensue.

*Inflammatory Rheumatism.*

WITH some people, rheumatism, rheumatologia, or chronic rheumatism and gout, all pass for rheumatism: with such as do not discriminate these cases, my boasted cure of inflammation may, and undoubtedly will, fall into disrepute. Electricity hath, by many, been recommended in almost all chronic cases, or cases of debility, or deficient excitement; and from its known usefulness in such cases, it hath been adored by many. But to apply this elementary fire in cases of inflammation, of increased action of fever heat, would be to add fire to fire, fuel to flame. It hath been supposed, that nothing in nature could be more absurd, or more dangerous; that it would tend directly to increase an inflammation; but the contrary of all this is just the truth. I do not mean, however, that the electric shock is of no use in cases of deficient excitement; but that it is, as to some of the effects of deficient excitement, a direct remedy: but as to its being a stimulus, it is only indirectly such; and that



when it is pursued to a certain degree, it is a direct debilitator ; and, being such, and in that very peculiar manner, before described, is a direct remedy of fever and inflammation, goes to the very bottom of the cause, in such a manner as no other medicine on earth can possibly do, and removes tension in any degree, and reduces to any state or degree of laxity, at the pleasure of the operator, and performs all this in the hands of a judicious electrician, without the least prejudice to any part of the animal system : but, on the contrary of that, if the strength of the shock doth not exceed due bounds, all the animal functions, essential to life and health, are assisted ; digestion is promoted, any retained coagulated fluids are separated, and carried into the circulation ; and being attenuated, and the natural evacuations promoted, the fluids become cleansed and purified ; it removes any extravasation that may be of the blood, any cause of polypus, gravel, ulcers, cancers, &c. &c.

Thus, while we are removing the most malignant of diseases, by this innocent, powerful, and most blessed of all medicines, we have the additional satisfaction of knowing that we are, at the same time, laying a foundation for the enjoyment of perfect health in the patient.

But, as to the manner of removing the inflammation in a rheumatism, the generally increased action of the vessels, and the suppressed perspiration, must be treated by electricity



as fever ; and the local affection must be treated as the lungs in a peripneumony : for not only the lungs in a peripneumony, but also any other part, highly irritated and inflamed, can hardly bear any degree of an electric shock. Wherefore, all the relief must be given that is possible, by taking off the increased action, and by inducing a rapid perspiration, before a single shock is passed through the local affection, or seat of the disease.

In treating the local affection (vide page 89th) the same precautions must be observed that you do not wound this seat of inflammation, that are necessary in commencing the operation on the lungs, in a peripneumony. Moreover, the retained morbid matter will be with more difficulty removed, should these dilated and irritated vessels be additionally dilated by the shock ; the reduction of the swelling would be retarded, through the inaction of these particular portions of vessels. For, in spite of all the stricture of fever heat, the diameters of the vessels, in the seat of the affection, are distended, by a redundancy of morbid matter, blood, &c. Hence, the cause of pain arises from the tightness with which the vessels embrace this redundancy. The pains in fever are of a similar description, or from stricture simply.

After the sthenic diathesis is removed, and the action of the vessels reduced to a state of health ; the local affection may be treated by

Perkins's metallic points ; they would, by a continual stroking, assist the vessels in carrying off their morbid contents ; although not so suddenly as the gentle shock. This, with much deference to Dr. Perkins's opinion, I conceive to be their chief use ; and perhaps a pair of steel-pointed scissors would answer the same purpose. Their friction may, however, remove spasm, when it approaches nigh to the part affected. \* In applying the shock to local affections, suppose in the knee, the shock should occupy a greater space than the affection of the disease ; that is, in the supposed case, the shock should be passed from about the hip through the knee, nearly or quite to the foot : if reduced sufficiently low, they may be given in great numbers. I have given sixty, seventy, eighty, to one hundred in a day, but exceedingly light. Purgatives are very

\* It is not a little astonishing, that a man of education and talents, should fall into the notion, that fever and inflammation should originate in an increased quantity of elementary fire, (for it must be that if any thing) imbibed in the human system, that might be extracted by pointed instruments, like what may be extracted from a person plus electrified, on an insulating stool. This appears to be Dr. Perkins's notion of fever, as is evident from his attempting to treat the yellow fever at New-York with his points. It is to be regretted that his mistake should cost him his life ; but it proves him to be sincerely mistaken. I doubt not, but that some cures were effected while some of these were operating ; but these might be effected by the stimulation of the imagination ; and such I suppose to be the principal cause of cures wrought by those fanciful gentlemen called animal magnetisers.

often necessary in a high degree of inflammatory rheumatism.

*Inflammatory Sore Throat.*

WHEN the pulse is high, and the perspiration suppressed, administer electricity in the same manner and degree as for a fever, not omitting the other diaphoretics, or assisting means of sweating : if a purge is necessary, give it : after perspiration is effected, and many shocks passed from shoulder to shoulder, and from under the chin to the feet, with the neck warmly covered, prepare a decoction of the inside of white oak bark, which any body will understand, and let the patient drink a little at a time of it, till well : the electric shock will remove the inflammation, and the bark will heal the internal soreness: The electrical shocks, in a proper degree of warmth, will absolutely effect the whole cure, but may be assisted by as many corroborants as you can obtain. Any internal inflammation, or dilation of the lungs, by a suppressed perspiration, may always be removed, in a little time, by the shocks passed in proper directions, and in due degrees, upon the part affected, &c.\*

\* Who, that knows by what means America lost the founder of her national greatness—what the disease that proved fatal to our greatly-beloved WASHINGTON—and will not feel with me, that it is almost too late to bless mankind with the knowledge of this inestimable mean of life and health ! I say to myself, had physicians attended to the en-

*Small Pox and Measles.*

VOMIT, if there is too much bile, and purge as may be necessary: But to abate inflammation, to ease pain, to bring forward the eruption with freedom and ease (if there can be an eruption where the shocks are given) let the shocks be passed throughout every part of the system, and repeated at intervals, if necessary, If there is danger of the eyes receiving any injury, let the head be covered, and shocks passed from head to foot, from the forehead in particular. Electricity is of infinite value, when people take it the natural way, and unprepared; it often proves fatal: but here, kind reader, is an infallible remedy in small pox or measles; take them how you may, the electric shock will immediately open a sufficient evacuation, whereby to throw off the infection, to keep down inflammation; and if you apply it in due season, you may pass the operation of either without the least pain or danger of life. But you must understand that the temperature of air must be exactly contrary to what is proper when you do not electrify; that is, your whole safety depends on your avoiding every the least coolness, till you are completely well.

treaties of some good and great characters in England, who have asserted, from a thousand experiments, that electricity far exceeded all medicine they ever knew, Mount Vernon might now have enjoyed her delight, and America her glory !!

Pregnant women have trembled, and not without reason, at the idea of the small pox in that peculiar circumstance; but here, good women, is your safety—keep warm; and about the time you begin to feel the symptoms, electrify just enough to keep down inflammation; rather let the shocks be light, and increased in number; take them in every part, but least through the uterus; the fermentation will be thrown off by perspiration; light shocks must be repeated at intervals for two or three days, till the whole infection is voided. A skilful physician should conduct through the whole treatment in this case.

The improvements in the art of inoculating, render it very safe and easy to undergo. But when difficulty arises in that treatment, I advise any person to change their temperature of air peculiar to that treatment, and assume that steady degree of warmth peculiar to treating by electricity, and commence the operations without loss of time.

The first I tried the experiment upon, was a son of mine, about nine years old; he was inoculated at Whitestown; I never changed his common diet, nor gave him the least aid by any other means; I kept him within the house, and warmly covered; I electrified him once a-day, about twenty light shocks at a time; the consequence was as I expected; he had not the least symptoms of fermentation, of inflammation, of pain, nor of eruption in any degree.

The place of incision was a little scarified by its working there. They who choose to go through the operation of the small pox or measles, without suffering any thing by the symptoms, by pain or by the eruption, may do it at their leisure, by observing rigidly the foregoing directions. If by any unavoidable accident the patient should take a cold, in this or any other case, it must be immediately removed by the shock, &c.

*Madness.*

WHEN madness is attended with a strong hard pulse, and with or without redness of face, there is an indication of a redundancy of blood in the head, and a compression and irritation of the brain, or of those nerves that proceed from the brain, or the basis of the brain, the cerebellum medulla spinalis, &c. all which may take its rise from a redundancy of blood in the head. This compression and irritation on the seat of sensation, of those nerves of such exquisite sensibility, is sufficient to produce disorder in the mental faculties, such as madness or delirium.

To remove this redundancy, is to remove the direct cause of the disordered mind: as to the indirect cause, it is of no consequence to enquire; undoubtedly there is a combination of them, partly from the peculiarity of the present habit, and partly from the present state of agitated spirits upon that habit; all which may form or constitute the indirect cause of the deranged mental powers.



In order to remedy the immediate cause of this disordered mind, the excessive action of the aorta ascendens must be suppressed, and that excessive pressure of blood to the head must be thrown down: this can only be done by the action of the electric shock, passed from the sides of the neck to the feet. And, by the way, this case requires as strong an action of the shock as any case I know of. It is sometimes, if not always the case, that when there is an over-action in the aorta ascendens, there is a deficiency in the action of the aorta descendens, or at least in the extremities of the arteries towards the feet; and this is more probably the case, when we consider that the lower extremities are more exposed to suffer abuse from colds often, and frequent dampness; great exertion upon the solids in exercise, thence a sudden transition to inaction, hence a cold upon the lower extremities; but so far from the seat of life, it is not noticed in producing any direct effect upon the system. But one of the consequences is, the aorta descendens is unable to receive its equal quantity of blood from the heart; hence the ascendens must receive too much; the blood cannot flow freely to the extremities of the arteries downward; and hence they press too violently to the extremities of the arteries upwards.

But a strong action of the shock goes to the bottom of this case, and restores an equilibrium in the circulations, and frees the head



from the affection. It is not certain what number of shocks will be necessary; there may be eight or ten strong shocks passed from the sides of the neck to the feet, each day; and as many light shocks passed from the top of the head to the feet, at the same time. Some means must be had, if possible, to keep the person warm. The operations must be repeated till the patient is restored to the right use of his mind; the strength of shocks may be abated from day to day, as occasion may require. In the habit under consideration, bleeding would give a temporary relief; but as soon as the vessels were again replenished with their former quantity, the same affection to the head would be resumed.

I can have no idea of plethory, or too great a quantity of fluids in the system; but that all those symptoms which have given rise to such a doctrine, have proceeded from extravasitation, unequal distribution or morbid tension, in whole, or in a part of the vascular system.

As it is peculiar to the action of a strong electric shock to remove tension, and to restore an equilibrium in the circulations, so it is peculiar to the shock to remove all those symptoms on which the doctrine of plethory is founded.

But, notwithstanding, until a mean of taking off tension could be found, it hath been well enough to tamper with the effect, since

the cause was either not known, or else could not be reached by any known means.

If the electric shock can be applied in the first stages of madness, before indirect debility takes place, it may be immediately removed; for the exciting power, so far as it consists in the animal functions, is instantly abated. But the exciting power, so far as it exists in the mental faculties, whether it be horror, vexation, intense grief, &c. must have mental applications—all those soothing, entertaining, enlivening objects and funny topics of discourse, must be indulged in all their conceits, nor irritated by thwarting nor too much opposition to their spleeny notions.

These last symptoms are constant attendants on insanity in debility. When it consists in indirect debility, or from what commenced in raging madness with a strong pulsation in the first instance, it will require a greater length of time to remove it. This case of indirect debility, must be treated by electricity in the same manner as insanity in direct debility, just now to be described.

I have found, by experience, that gentle shocks through every part of the system upon the nerves, and through the stomach, and down the back of the head, upon the top of the head, through the brain to the feet, have assisted in restoring a person to the use of reason. The case I have respect to, and my manner of treat-

ment of the case, I will relate in full: It may be the most intelligible receipt.

The person was a young married woman, and lived in Milton, Saratoga county; she came to me at Ballston pool, in the summer of 1795, if I remember right. She was attended by her mother and some others; her mother was the only person she would correspond with; who had, in consequence thereof, taken her to her house; she was terrified at the sight of her husband, with whom she had lived in perfect cordiality, until she became insane. She had a young child, in suckling of which she was reduced to that debility that gave rise to her insanity; and perhaps there was some other corroborating causes, that might contribute more or less to confirm that degree of debility. Her child she would take no notice of, nor suffer any person to come nigh her, but her mother. It was with much difficulty that her mother could prevail with her to take the most trifling sustenance, and that must be done in absence of every one but her mother.

Such was her situation after being attended about five months, to no good purpose. She was emaciated almost to a skeleton; deep dejection of spirits, gloomy and melancholy.

I observed all the decorum mentioned page 106; used all the address in my power to ingratiate myself into the number of her friends, which consisted then of her mother only; this I knew was previously necessary, as I could

have no opportunity of administering to her in that situation. Her husband came to the house—I observed her terror—I laid hold of this opportunity to gain upon her feelings; I would not suffer him to come nigh her, pretendedly so: It had the intended effect. To be brief, it was not long before I was able to persuade her to take a little wine; after this, under the appearance of entertainment, we got her to the machine, when I passed some very light shocks in all the before mentioned directions. We regaled her with all the lively appearances in our power. The next day she could be induced to smile; this gave me great encouragement. I alternated light shocks, with wine, diluted brandy, &c. and as her mind began to be caught with lively appearances, we endeavoured to furnish all the variety that was possible. The consequence soon was, all that gloominess of mind was dispelled, and she gradually assumed the appearance of cheerfulness; her digestion was promoted, and she began to take nutritious food freely. To be short, in four or five weeks she was able to unite with her husband again in keeping house.

I had another case, just before this, at the same place: It was a Mr. — Olcox, tinman, within half a mile of the pool. Several years before I saw him, he had been in a delirium, and, taking the advantage of the absence of the family in the evening, cut his throat across, with a case knife; but some one coming in soon

after, saw him lying on the hearth, and bleeding in this frightful manner—ran and called assistance; a doctor came soon, sewed up the wound, and saved his life. His bleeding restored him for that time; but it had gradually increased upon him for some time before I saw him; and I was told by some of the family, that he was apparently more insane at this time than before he had cut his throat. It was with difficulty that the people got him to me, for he was obstinate, to an extreme degree, in every thing. As there was no flattering of him to any thing, they forced him to the machine, like a bullock to the slaughter. I observed his habit was firm and sanguine, his pulse very turbulent; I administered exceedingly heavy shocks upon him, in the directions which I have recommended in such cases. This being done, he returned home; the next day he came again, was apparently better, but would not own that any thing had or would do him any good; he however took the shocks with less resistance, and began to sweat freely; this he noticed himself, as something very extraordinary, for he said he had not sweated in any degree for thirteen years; to this his friends assented. These two turns to the machine, restored him at that time, and he was soon willing to own that I had made him, as it were, a new man. I heard of him repeatedly for three years, and he remained well.

I will mention one case more, similar to this. The following summer I had moved to Galway. A young man hearing what I had done at the pool the preceding summer, came to me, and informed me that his father was crazy; and desired to know if I thought I could help him. I inquired into the circumstances: I found he had been a well, strong man; that the preceding winter he had sold a large farm, had come to Galway, and purchased two others adjacent, but that he had lost, by some deception, a considerable part of his interest; and that this chagrin had produced this effect upon his mind. His family had become much alarmed, and were upon the eve of chaining him; I advised them to watch him till they could get him to me, and take care that he did not kill himself, or any one else; for he told them that the devil said he must kill a daughter of his. I think it was the next day they brought him forward, sometimes in a waggon, and sometimes out of it; several people assisted, but they could not keep his clothing upon him; for he was mad indeed. By the time he was brought to the machine, which was a very costly one, I expected he would break it to pieces; but there being about twenty men to assist, we got the chains to him, and as I did not expect we should all be able to get the second shock upon him, I charged the machine as high as I thought he could bear, and live through; for his arteries were in the highest state of action that ever I

discovered: I passed the shock upon him, which almost knocked him to the floor. I passed the shock from the top of his head to the feet, but it should have been from the side of his neck; it would have been easier to sustain, and otherwise answered as good a purpose. He appeared sullen after the shock; but we were able to repeat the shock with less difficulty than I expected: I gave six or seven more, but lighter. He went home, and was more composed in his mind the next day, as I was informed; but it was necessary to bring him again, which they did, but with less trouble; notwithstanding, they could not keep sufficient covering upon him to keep him from taking cold, which prevented his recovering so fast as otherwise he might have done. I give him a second electrification, and they took him home, and it was not long before he had the right use of his mind, was composed and well. I would have mentioned his name, but it has slipped my memory.

I hope that all these united efforts will avail to induce people to try the same experiments on such unhappy people as may be deprived of the use of their reason by any of those means which may be supposed to be curable. It may be observed, by the way, that those three cases that I have instanced, were recent ones; and that I do not expect that old cases, or those that may proceed from causes altogether dissimilar to those I have described, or simply from nervous irritation, are likely to meet with



so sudden relief; but that it is expedient to try these means in almost all cases.

Where a lengthy application of electricity is absolutely necessary, there is no doubt but that there will be great difficulty in attending and treating a mad or an insane person with the electric shock; that is, to keep them sufficiently warm: this must absolutely be done, or no good will ensue; especially if the patient is in either direct or indirect debility. The supernatural insolation would be of unquestionable use in cases of debility; but it should be continued in some cases, perhaps, for months successively.

In order that this operation might be properly performed, it would be necessary that an insulating bed was prepared, and the insolation, or artificial supply of this ethereal fire, was made by the assistance of a water-wheel, that the insolation might be constant night and day, that the patient might sleep in an insulated bed; and if, at any time, a vertigo was induced, to pass a few shocks from the hips, or from the sides of the neck, to the feet. The insolation may be perpetuated by a large machine, turned by hand, but it would be more fatiguing.

### *Ague.*

IN treating of this case, I shall venture to take the liberty of giving my own opinion of the cause and manner in which this uncommon

or singular revolution is produced or effected in the human body.

This disease is peculiarly incident to people living in flat, low lands, where the heat is intense, partly by the flatness of the surface of the land, and partly from still bodies of water, as by the action of light upon these smooth surfaces, the heat becomes intense, and the circumjacent air is divested of its elasticity, or there is a great deficiency of the natural quantity of this expanding, dilating, vibrating, or stimulating element, we call ethereal fire or electricity.

It hath been abundantly proven before, that this elementary fire is the very criterion of animal life; that in proportion to the degree of the natural quantity, so is the degree of animal life and vigour existing in that quantity.

From the intenseness of heat in those low marshy lands, there is a rapid exhalation of noxious vapour, diffused throughout the circumambient air, which is undoubtedly unfavourable to health; but this, simply considered, doth not lead us to discover, in any philosophical manner, how debility should originate in that source, even that great degree of debility that gives rise to a fit of the ague.

But upon the other principle, it is an obvious result or consequence of a deficiency of this vital stimulus. This will further appear, if we consider that the revolution, as I call it, of an ague, proceeds from a deficiency of energy in

the arterial system, in particular. There is an equal degree of debility throughout the whole vascular system; but the ague originates in the deficiency or inability of the heart and arteries to propel on the blood towards the surface: And this languor, we may with propriety conclude, hath its source in a deficiency of the natural insolation, or natural quantity of the elementary stimulating fire: For it is well known that an additional degree of this stimulus, supplied by art, will invigorate and strengthen the circulations, and militate directly against an attack of the ague. Not only so, but the ague is never known to originate in any country of high lands, where the heat is less intense, or where the natural quantity of electricity is not rendered too deficient, by intense rarification of long continued heat.\*

\* It should be remembered in this place, that it hath been demonstrated, that heat doth divest air of its natural quantity of ethereal fire, or electricity, or that it is highly probable, from the absolute certainty of its producing that effect on other substances, or bodies; such as glass, bees-wax, and some other bodies: which substances, by some unknown transmutation, or configuration of the electric body, are changed into the very substance, as it were, of glass, and constitutes its transparency, its elasticity and brittleness; and is so made up of this very element, that no artificial quantity can be added or approach it, until the natural quantity is first reduced by heat; then it will receive and convey the artificial quantity as freely as water or metal. Bees-wax imbibes so great a natural quantity in its cold state, that it is as impervious as glass almost, to the approach or passage of an artificial quantity; but by being heated, it is as susceptible as water.

The ague commences in the following manner, viz. by reason of extreme laxity in the heart and arteries, they become unable to propel on the blood towards the surface; at this instant the blood recoils upon the heart, and round about the heart in the arteries, forming a kind of extraversion of the blood; the heart and arteries in the chest, labour with an excessive redundancy, greatly distended and irritated, and finally highly inflamed. The subject of it is insatiable with drink during this stage of it. But the surface experiences a very different sensation: this reflux of blood upon the seat of the circulation, has left the coldness of death upon the surface: this will remain until the internal heat shall have, by its time and degree, induced a sufficient degree of tensility, or stricture on the heart and arteries, that will enable them to propel on towards the extreme parts that excessive redundancy that inflamed them. As soon as this sufficient tensility is formed, the blood comes forward towards the surface with fever heat; and that inflammation which was first internal and local, now becomes external and universal.

This appears to be the true circumstance of the case, so far. And it will follow, that this acquired morbid tension will, according to the degree of it, resist another paroxysm: if the internal heat continue long, the fit will be resisted a length of time, in proportion thereto; but if the internal fever heat be of short du-

ration, the resistance to another paroxysm will be proportionably short. Hence the quotidian and tertian agues are more violent and of longer duration in their paroxysms, than those that occur daily; and this longer continuance determines the duration of that resistance to the next paroxysm. This acquired tension may, however, be lost by some accident, by bodily or mental fatigue, by unusual abstinence from suitable nutriment, &c. all which may shorten the term of resistance to the next ague. A trifling cold will infallibly induce an ague very suddenly, which is a circumstance that people but little notice, and which is a very common cause of this disease remaining so long.

The cause of those fevers continuing so short a time, is partly owing to the brevity of the existing cause, and partly to the less comparative degree of tension on the surface, with that which exists internally. The internal energy of the arteries, forms an exertion towards the surface, and the resistance by suppression of perspiration through tension on the surface, being little or nothing, a diaphoresis is quickly induced, and the inflammation must subside. The pores being very open at the close of every paroxysm, renders it very necessary that people should observe a steady degree of warmth in this disease; even when they are not electrified.

These ague-fits, like the epilepsy, are more easily prevented than remedied or removed, after they have once commenced; the system is much weaker after the first paroxysm, than before. The arteries are so excessively dilated by the redundancy of blood, that notwithstanding their temporary stricture, acquired by the fever heat upon them, it is soon lost; and being lost, they are in a greater degree of laxity than before.

The use of the electric shock in removing an ague, is sometimes very considerable, and often a radical cure; it is of use to throw off the jaundice, to regulate the secretions, and in fine, to prevent its terminating in a bilious fever. But this is not all; it will prevent the gradual reduction of the existing tension in the system, by preventing the dilation of the arteries, through the redundancy of blood in this unnatural reflux upon them.

That this operation may be made properly, the shocks must be passed through every part of the system, but especially through the chest; and this must be done at the instant, or if you can guess the time, a few minutes before the sensation of cold commences: these shocks must be repeated until the sensation of cold subsides: the intention of the shocks is to stimulate, or impart elastic springs upon the arteries, thereby to enable them to perpetuate the free flow of blood towards the surface, which they will do, and restore a sensation of warmth



in consequence thereof: in performing this, the arteries are secured from that redundancy which ultimately diminishes their existing tenacity; and the patient is relieved from much pain and distress, even when the fits are not intirely removed thereby. But by performing this operation, at the proper time, as above mentioned, for two or three several paroxysms, they will frequently cure; and if not, they will greatly relieve the patient. The shocks must be passed from the right hand to the left, from the sides of the neck to the feet, and from the back to the feet: lastly, pass a few from the forehead to the feet, if there should be any pain in the head.

By this time it must be understood, that the shocks must be light, as this is well known to be a case of very great laxity. The minutest care is absolutely necessary, that the patient observe a steady degree of warmth; the most trifling variation, or the least degree of coolness, but for a minute, will induce a fit of the ague, in this critical situation; so also will a little mental or bodily exercise, or food that is not easily digested; all these things must be observed by the person who wishes to be restored in a short time. It should be remembered, that if by any inattention or carelessness, a fit is induced, the consequence will be, that the cure is unavoidably procrastinated several days. Hence from a number of these causes, it has happened that physicians have so frequently failed of



giving relief in this disease. Although they have not generally had the best means, yet they have been possessed of such as would very often cure in this case, and the cases would have been more frequent, had not the patients been wanting in themselves.

The supernatural insolation is of importance in this case; a high degree of insolation, if commenced an hour before the fit, will resist the paroxysm considerably, or totally prevent it: this, however, depends on the degree of the insolation; if it is very high, it is impossible that the ague should commence; but a weak degree of it, conjoined with a few light shocks, and a small dose of opium, diluted or in substance, will, unless a miracle prevent it, resist the fit to all intents. This is the mode of treatment which I shall recommend: use all the artificial insolation that is possible, from day to day; and about an hour previous to the paroxysm, stimulate and raise the tone of the vessels, by that mistaken old sedative, opium: if the sense of cold, or as oft as the sense of cold shall appear, assist the action of the arteries, by a few light elastic springs; these shocks will also attenuate the blood, and facilitate it to the tone of the vessels. If a puke is necessary, give it, or any other evacuant.

#### *St. Vitus's Dance.*

THIS involuntary motion is easily cured by the gentle electrification, daily administered,

and by repeated infolutions. Let light shocks, to the amount of twelve or fifteen, be daily passed upon the whole nervous system. I have had but one case of this kind; it was a young girl, niece of Mr. Merrill, Ballston pool; she had been several months in this situation. It was with difficulty that she could articulate so as to be understood, or ascend or descend a flight of stairs, &c. she had been under the care of one or two physicians; but by some means, received no perceptible benefit.

The method I pursued, was to give her about fifteen light shocks in every part of the body and limbs, in the evening; then put her into a warm bed, and gave her freely of some diaphoretic herb-tea, the more readily to produce a sweat. She was kept in a gentle perspiration three or four nights successively; but in half that time she was evidently better, and in about ten or twelve days was intirely well.

This girl had symptoms of a cachexy of the fluids, by corrosive tetters on the surface; this caused me to conjecture, that this involuntary motion proceeded not so much from debility, simply considered, as from those sharp humours, as I conceived, to prick and irritate the nerves, and cause them to spring and move, without the volition of the will. And in the sequel I was confirmed in my opinion: the recovery was too sudden to admit the idea, that the cause was debility; but it was not too sudden to admit of the idea of its proceeding from an

irritation of the nerves, by the action of a vitiated state of the humours upon them. It was familiar to me, that no means on earth were able to cleanse the human body of a cachexy, or purge the blood of vitiated humours so suddenly and effectually as that of electrifying freely, and this succeeded by deep sweats. I formed my process accordingly, and it had the desired and intended effect; and purging off the humours, was the cure of the involuntary motion of the nervous system. I insolated the girl two or three times only, and this was not continued half an hour at a time; so that the cure could not be founded on the action of so short a stimulus: moreover, she was not insolated until after she had received some degree of betterment. The most of people exercised with this complaint, are in habits of debility. This was my reason for recommending it, to corroborate with the shock.

#### *Hysterics.*

THE spasm that attends this disease being a secondary effect, arising, undoubtedly, from compression and pressure—the whole affection the pressure to the stomach, head, &c.—all will immediately subside, by passing the shocks, in due number and force, from the sides of the neck to the feet. This compression and pressure is suddenly counteracted by the depression of the electrical shock upon the part affected. I have seldom had occasion to give more than twenty shocks, and mostly light ones, to re-

move one of those rude fits. I have used the shock in this manner, I think, in hundreds of cases; and have ever found it to have one uniform effect, such as above described. The effect of removing a paroxysm by the shocks has been, that when women have been careful not to take a cold immediately upon the shock, they have been less subject to the paroxysm for a longer time, than when they were removed by other means. Electrifying from the hips to the feet only, would be sufficient to prevent a paroxysm, would women be careful to keep their feet warm.

Doctor Graham, of London, who used medical electricity a considerable time, and found it to be so exceedingly useful to women, in diseases peculiar to themselves, hath said that women may, with propriety, adore electricity.

There is a certain effect produced by the electric shock, which I have scarcely noticed as yet, and which may as properly be introduced here as any other place, inasmuch as this singular effect is concerned in the cure of the disease now under consideration.—The effect I have reference to, is what caused Doctor Franklin to say, that the shock determined the blood, one way or the other, according as the shock was directed. Dr. Cavallo, a late British writer upon medical electricity, hath, barely, contradicted Franklin's assertion. I think Doctor Cavallo had better been silent on this subject: for there is an effect produced

by the shock, which doth, in some respects, cause the blood, but particularly certain affections, to move in the same direction as the shock: and to know this, is of great importance in the cure of several diseases. But it appears totally to have escaped the observation of Cavallo. Indeed, the whole system of principles hath escaped, not only Cavallo, but all other writers on the subject.

From several observations, which I have made in many thousands of experiments, I will endeavour to define this phenomenon, in the effects produced by the shocks on the human body. It hath, at least, been hinted, that the shock doth determine the course of blood; in some degree: this was necessarily supposed to be one effect produced, otherwise it could not remove a redundancy of blood from the head. It is supposed to effect the removal of stagnant fluids, wind, &c. in the same direction with the shock, as is frequently the case, (vide *Pleurisy*, page 111.) It is supposed to determine the course of removal of certain affections; as, in the particular case now under consideration, it is supposed to effect the depression of the hysterics. That it doth produce these effects, is incontestibly true, and may be demonstrated, in every occasion that presents itself. Shocks passed from the upper extremities to the feet, cause the blood to flow more freely towards the feet, and induce warmth in the feet. Moreover, I have observed, that when

I have electrified parts that have been badly bruised, the coagulated blood not only tends immediately towards the surface, in a very visible manner; but I have noticed, that it would diffuse through the muscles, from the part affected, in the same direction in which the shocks were passed.\*

One observation more, and which I think will determine in favour of Doctor Franklin's opinion, and will be conclusively against Cavallo's; and that is, let any person, of a sanguine habit, pass a few shocks from his feet to the crown of his head: it will generally, or invariably produce redness of face, sometimes vertigo, and there will be a sensation of an increased bulkiness of the head.

A certain physician, who had just purchased a machine of me, by some mistake took the shock ascendingly to the head, for the toothache: It gave him all the above mentioned sensations, except vertigo; but it cured his toothache.

From the above cited occurrences and observations, it is demonstrably true, that the electric shock, when passed upon certain affections, doth determine the course of their removal;

\* If the electric shock will separate such a coagulation, and, what is still more beneficial, throw it towards the surface; what shall we think of physicians who have remonstrated against passing the shock upon a body of humours, lest they should fall upon some vital part, and prove fatal, perhaps, to life, &c.



and that it tends also to propel humours towards the surface of the body; and that, consequently, the patient doth void them by perspiration. And it is equally true, that when the shock is passed upon a set of vessels, but especially the arteries leading to any particular part, and the shock passing in conformity to the motion of the arteries, it doth assist them in forming a redundancy in that part to which the arteries lead, the shock being in due force.

From all that hath been said on the subject, may be learned these two things: First, That in order to affect diseases in a proper manner, there should be a judicious attention to the direction of the shock; and, secondly, That as there hath been no knowledge of this particular matter, nor indeed of any thing founded on rational principle, respecting medical electricity, it is no very great marvel that it is in no higher estimation among the generality of mankind. Any man may use a machine; but he must be well instructed, that doth it properly.

### *Epilepsy.*

THIS disease may sometimes be cured, but may always be relieved, by electrifying. If you can know by the symptoms, at any time, when the fit is coming on, you may prevent it for that time, by giving a few shocks. It will also throw off the spasm, and bring any person out of a paroxysm immediately, by passing a few shocks



from hand to hand, through the breast, and from the sides of the neck, and from the top of the head, to the feet.

I suppose there are several causes of epilepsy, and that it is difficult to trace them with precision. It is, at least, a very obstinate disease, and sometimes baffles all medical skill. It is found, however, by experience, that the gentle electrifications go the farthest in relieving persons who are so unhappy as to be subject to it. Those cases which I have radically cured by the electric shock, were such as I had reason to apprehend proceeded from some disorder in the head—perhaps compression of the brain, from some cause or other, or some part essential to life and health contiguous thereto. The evidences were, a great degree of stupor, and loss of memory: The more these symptoms appear, the more hope there is of a cure by the electric shock. If the cause appears, from these symptoms, to exist in the head, the shock may be passed from the top of it only, to the feet. If there is evidently a redundancy in the head, it will be expedient to pass some strong shocks from the sides of the neck to the feet.

There is a general utility in electrifying for all kinds of fits: even when you cannot totally cure them, they are always made less frequent, and generally shorter and lighter; not only so, but it will forever prevent stupor, loss of memory, &c.—will preserve the mental faculties—insomuch, that there is as little danger

of their being impaired by the fits, as there is by the most trifling disease. I have experienced this blessed effect of the shocks, without any exception, in about one hundred cases: The stupid have assumed their former vivacity and cheerfulness, and have been restored to the full possession of their former mental abilities. These effects are produced by passing the shock from the head to the feet. If the fits cannot be finally cured, it will be necessary to electrify in this manner: to pass two or three shocks at least, from the forehead to the feet, as oft as every second, third, or perhaps fourth fit, in order to preserve the mental faculties. It will be easy to judge from observation of the patient, at what time it will be necessary to electrify.

When it is apparent, that general debility hath a part, at least, in constituting the paroxysm, I think it would be expedient to accompany the gentle shock with a high and constant insolation. Depend not on insulating for an hour or two hours in a day; but let it be continued for months, if necessary: there can be no satisfactory judgment made of the ultimate benefit of the supernatural or artificial insolation, in such obstinate cases, or any case of great debility, unless the insolation be continued for a long time; and to effect this purpose, a large construction will be necessary, and the best of all, would be such an one as I have recommended (vide page 93, chap. 2d.) to

be turned by the assistance of a water-wheel. The action of this invaluable principle of life, continued a lengthy time, must produce very valuable effects, in cases of deficient excitement : and as it is taught by some notable writers, that epilepsy originates in debility, at least sometimes, I think it will be highly expedient to try the utmost of the artificial insolation, in these obstinate cases of epilepsy. Under a process or treatment by insolation, I do not advise to administer the shock, unless the symptoms of paroxysm may be discovered ; or when there is no apparent admonition to be observed, and the fits are nearly periodical ; then to electrify as before described, beginning the operation, as high as may be, two or three days previous to the paroxysm ; and give about twelve or fifteen light shocks, in the several directions before named, but let the last shocks be always given from head to feet. This number of shocks, or perhaps one half this number in some cases, may be given daily, until the usual period of the fit is passed two or three days, or longer. But the paroxysm should be constantly looked for, and the patient constantly observed, and the apparatus at hand ; that if the symptoms cannot be observed, yet that the fit may be instantly removed by a few light shocks. I have observed, that when the shocks through the breast from hand to hand, would not instantly recover a person from the spasm ; I have passed the shock from

the forehead or top of the head to the feet, and they have immediately recovered their senses. This circumstance of the shock through the brain, being so very efficacious in giving relief in the epilepsy, has led me to suspect that the fit proceeds more from the brain, or the heads of the nerves in the medullary substance of the brain, than hath been generally suspected : the spasm, however, doth commonly, or always commence first in the head. I have seen persons, in the commencement of the paroxysm, standing upon their feet, their eyes drawn erect, their bodies turning swiftly round, until they fell by the universal spasm. Admitting that the epilepsy proceeds from some defect in the seat of sensation and the source of volition, it is no wonder that the electric shock has such an ascendancy over any other means that can be found; seeing it is the only means, that can act directly upon the brain and seat of the nerves : but as there is such an intimacy of sensation and sympathy between the brain and the nerves proceeding from the brain, that it is difficult to determine whether the defect is local in the head, or universal upon the nerves. I have inserted these remarks and observations that those who have abilities may judge of their value, if they have any.

Decoctions of valerian root, alternated with opiates, are sometimes beneficial. The patient must keep warm ; one slight cold will bring on a paroxysm.

Cramp in the legs, or any other part, is always relieved for a time by taking a few light shocks upon the part affected: if the part is kept warm, it will keep the cramp off a long time; but if you wet your feet, or let the part be cold, the cramp will return immediately.

### *Consumption.*

SEVERAL European electricians have recommended gentle shocks in a consumption. I saw a German doctor who said he could always cure a hectic fever by electrifying. But the process by electricity is attended with no small difficulty: this will consist in the temperature of air; there must be a degree of warmth, or the patient will take cold, and there can no cure be made: they must not be too warm, or they will be emaciated to death, by perspiration: in short, there must be no variation of a steady degree of warmth: let this be first determined upon; then proceed to electrify through the vitals, but very lightly: do not suffer a shock that will weaken the patient, by dilating the vessels; they must be obstinately light. On the first electrification there may be twenty shocks given; but some of the last may be passed from the forehead to the feet, that the head may be free from pain and dizziness. For three or four the first days, the patient may receive nearly this number of shocks; but the number may, and must be reduced: it will by no means be necessary to

continue an equal number daily, or on the days of electrifying, through the whole process of treatment by electricity. Suppose the consumption to be on the liver; suppose it ulcerated, tumified and inflamed; the first shocks will attenuate the humours, separate the coagulations, or cause purulent matter to be discharged. The stagnated mass of humours in the liver will be broken up, and the inflammation or hectic fever will subside; for this fever is constituted through the irritation of a part, and its beginning is purely local. Wherefore, after the body of tumefaction is removed, in general, the electrifications may be less frequent, repeated once in two days, or else four or five light shocks in a day: but this must be partly discretionary; if the person feels easier, if the cough is lighter, and raise quicker and more freely, and especially if the patient is very weak, forbear all the shocks that are possible; be careful not to induce any unnecessary debility. But the shocks must be repeated so oft as to cause the patient to raise easy and freely; after the shocks, give a dose of elixir paregoric, to stimulate the vitals, and enable them to throw off their morbid contents; this may be repeated once or twice a day. There is another excellent remedy, either for cough, consumption or jaundice; I learned it of an Indian, who was famous in the knowledge of roots and herbs, the productions of America: that is, the bark of bay-berry root, a certain



herb—looks much like a blue-berry bush, and produces a berry of which people frequently make a tallow, called bay-berry tallow. I have never known it to grow more than sixty miles from salt-water. The first time I used this remedy, was in a consumption on the liver: it directly facilitated raising, when the person coughed; and the person had a sensation of prickling, as he said, to the ends of his fingers: the use of it was continued about fourteen days, and the person got well. A French doctor, who had visited him several times, was knowing to my manner of treatment; he turned to an author, written in French, in which the tallow of this bush was recommended: but it was our joint opinion, that a decoction of the root bark was much better.

The roots being dug and washed clean, scrape off the bark; about a single handful may be put to a quart of water, and simmered over a fire till the substance is pretty well extracted, which will require an hour; let the patient take a large table spoonful twice a day, upon an empty stomach; but even some adults cannot bear quite so much, and some can take more, and not offend their stomachs; this must be continued, but in lesser quantities, till well. With this innocent and powerful mean, conjoin also the supernatural insolation, to keep up and invigorate the system: let insolation be as constant as possible: if this is continued



highly, there will be less need of the elixir pargoric to be taken ; it will answer nearly the same purpose.

Very few cases of consumption will fail of a cure by the gentle shocks ; but when this decoction of the bark and the artificial insolation are conjoined, the cases that will resist them, all, will be very singular and few.

The excellent usefulness of the shock, may be learned from the effect it produceth on external sores, and tumefactions and ulcers: the shocks being daily passed through the most malignant ulcer, will directly discharge the whole matter, clarify the humours, and cause the parts to contact and heal ; no means on earth will heal an ulcer in twice the time that the shocks require ; and indeed it will heal ulcers and sores, that no other means could be found to heal. Seeing, then, that this remedy is as easily applied to the liver, lungs, or any vital or internal part, as it is to a sore or inflamed leg, which it will always heal, who can shew any reason why it will not produce the same effect internally ? He that will dispute it must be a novice, or else wish to blind men's eyes. To speak plain English, there are remedies enough for external ulcers, tumefactions, &c. and the ancients attempted to heal both external and internal by nearly the same means ; but both ancient and modern practice have failed in the internal part : but thanks be to God, we have now a divine medicine,

and divinely pure in its nature ; it reaches to the recesses of the heart, to every internal part, producing all those effects that were wanting in other means ; just such as were necessary to consummate the medical art, and enable us to triumph over diseases. He must be purblind that cannot see, that if there are any cases of consumption which are past cure by electricity, that it is impossible, in the nature of things, that a consumption, tumefaction or ulcer should form, either internally or externally, while the discutiency of the electric shocks are passing upon the fluids : How think ye that polypuses, ulcers, aneurisms or ossifications can form in the arteries, where the electrical shocks are frequently acting upon them ?

If these means fail of curing a consumption, it must be in the last stages of it, or through want of a careful and judicious attention to the temperature of air, or mode of treatment. It is ardently wished, by a friend to man, that these new and excellent means of health may soon become so general, that dangerous diseases may not be suffered to proceed so far, as to render their cure doubtful.

### *Palsy.*

I NEED not say much to convince people of the propriety of using the electrical shock for this disease ; it is very generally known to be the best mean of restoring paralytic cases of any thing yet discovered. Notwithstanding,

as there hath been much impropriety in the manner of treating these cases by electricity, it will be necessary to be very particular in describing the regular mode of treatment. For many years after the discovery of electricity, or after the art of giving an electric shock upon the human body was rendered practicable, and attempts were begun to be made to restore diseases by the shock, it was one universal error to electrify too very strongly; the consequence was, that some diseases, the palsy in particular, would be considerably restored; but by continuing the shocks too strongly, there would be, first a cessation of betterment, and sometimes a total relapse into their former state; but this last circumstance must have been owing to another mistake, which was as universal and as detrimental as the former, viz. a total neglect of a steady warmth, which should have been constantly observed. But Dr. Cavallo, a gentleman of the Royal Society in London, in his treatise upon medical electricity, hath, with much accuracy, detected the error of strong shocks; and his writings have gone not a little way in recommending to mankind a more candid attention to the subject of medical electricity.

A partial palsy hardly ever fails of a speedy cure, by giving thirty or forty light shocks in the course of each day: several such cases I have restored in fifteen, twenty or thirty days. It is more difficult to restore the loss of motion,

than that of sensation : the loss of sensation is restored very generally in a few days ; about one shock in a hundred, should be so strong as to be perceptible to the patient, the whole distance of the paralytic part. If the tongue is defective, let a cork or piece of soft wood be held between the patient's teeth, and let one wire be held to the back of the neck, and the tongue being put forward of the teeth, lay the other wire to the end of the tongue ; then you are ready to pass the shocks : (the cork will prevent the patients biting their tongues when the shock is given) you may give fifteen light shocks on the tongue, in one day ; and by the way, the tongue is sooner restored than any other part, as I have often experiencéd.

When the palsy is total, there will be much patience required to effect a cure ; the shortest term cannot be less than three months, and frequently twice that time will be spent in effecting a complete cure ; this, however, is a calculation made from observing the degrees of betterment acquired during the several periods in which I have attended upon such cases ; two of them only exceeded one month that I continued the shock, and one of these two cases was totally cured in the course of a summer ; but the other was only partially restored, in the course of three months, or nearly that time ; but what I mean to notice, is this, that the longer the electrification was continued, the greater the degree of betterment ; but cases

varied very much in gaining betterment. From all which circumstances, I have made the calculations respecting the time that probably will be occupied in the various cases of palsy. This I thought expedient to be noticed, lest people should too easily despair of a cure. It may be observed, that the recovery of voluntary motion, will be perceived first in the part where the nerves spring, or take their rise, and will gradually proceed to the extremities of the same nerves ; this will lead the operator to understand, that the shocks must be passed from the origin of the nerves, in any particular part, to their termination.

The method of electrifying for the palsy, which I have found to be the best, after trying all methods, is to give, on the paralytic part, about thirty or forty light shocks daily, but about every hundredth with an encreased force, so as to be perceptibly felt by the patient throughout a paralytic limb, &c.

There is another method of using electricity in this case, which, for want of opportunity since I conceived of it, I have never experienced in this case. It is well known that blistering has often proved useful in a palsy ; and this being effected merely by irritation, it is more than probable that the irritation of drawing the electric spark would also prove beneficial : furthermore, if the irritation of blistering is sometimes, and perhaps always, more or less beneficial, how much more beneficial may

the extraction of the electric spark prove? especially, when we consider that the extraction of the spark may be repeated, and in such numbers, continually, on every part of a paralytic limb, &c. as to excite ten times the degree of irritation that can be effected by blistering; the extraction of the spark will also be attended with less suffering, or rather no suffering to the patient. I cannot but feel a regret, that this idea had never struck my mind, until it is too late to give demonstrative examples of its use in this treatise. But it is so self-evidently calculated to be beneficial in a palsy, that I think the judicious electrician will want no further arguments to induce him to put in execution a thorough experiment. In order to determine its effect accurately, it will be necessary to try the operation for a month, at least, without conjoining any other means.

The manner of operating will be, to cover the paralytic part with one or two thicknesses of flannel, and draw the spark through them; but must not draw too many exactly in one place, otherwise it will inflame and blister the part. By drawing great numbers of strong sparks from a wen, you may inflame and suppurate it, and any other swelling of the kind: wherefore there must be a continual varying of the place whence the spark is extracted, unless it is intended to promote inflammation and suppuration.



When I have used the gentle shocks upon a palsy, I have never been able to discover that any of the common celebrated specifics, when conjoined with the electrification, were of any use in accelerating the cure: I have several times conjoined a preparation of *Spi. Vini. Camp. Vol. Spi. c. c.* and applied this compound as hot as the patient could bear; in which state, the muscle will absorb a stream nearly as big as a large knitting-needle; but it is something probable, that the diffusability of the shocks, operating diaphoretically, propels the stimulus absorpt in the muscle towards the surface, and it flies off in perspiration prematurely.

### *Dropsey.*

FROM all that hath been advanced on the subject of medical electricity, I expect my reader will almost prevent me from saying any thing in recommendation of electricity in a dropsey, by saying it is already presupposed; and in every point of view, in which the effects of the electric shocks have been considered, we know it must necessarily affect a dropsey in a most agreeable manner. I do not mean to insinuate that your abilities are not sufficient to discern a thing so obvious to the weakest capacity; but it may be necessary, notwithstanding, to familiarize the subject by considering several particulars that respect a judicious treatment of the different cases of dropsey.

*Anasarfa*.—This is a dropfy on the furface of the body, an effufion of water fecreted from the blood and retained under the porous fyftem, but cannot be voided by perfpiration without the affiftance of art. This is always curable by the fhocks only: the method I have taken is, to give the patients as many fhocks in a day as they could conveniently bear; and three or four nights in a week, have given them profufe fweatings. In order to ftimulate the arteries, and propel on the perfpiration, I have given brandy with water very freely for conftant drink. The effufion will perfpire exceedingly faft, and you will difcover it in the reduction of the fwelling after the firft night's fweat. Great care muft be had in this, as well as all other cafes of electrifying, that the patient is kept fteadily fecured from coolnefs, night and day.

*Afcites*.—This is an effufion of water fecreted in the abdomen. I have ufed electricity but in two of thefe cafes, one of which was a woman: I electrified her but twice; I heard fhe was a little relieved. The other was a man, viz. ———— Robinson, Efq. of Chatham, county of Columbia. For fome time before I faw him, the fwelling had increafed upon him very much, and all means that formerly had given relief now failed; he applied to electricity, in this extremity, for relief; in five days he was a good deal better, infomuch that a veft, juft made, larger than ufual, and which he had

suddenly grown too large for, was several inches larger than was necessary to button round. He had been very much troubled with a singular disorder, in a part being inflamed with tetters, and finally produced an effect to prevent the possibility of voiding urine, by turns, without the assistance of the lancet: But this whole affection subsided in four or five days after the first electrification; he was able in a short space of time to proceed on a lengthy journey.

I will mention one case; it may reflect some light. A gentleman called on me at Ballston pool; he was troubled with a rigidity on the whole nervous system; he could move all his limbs a little, but they were stiff. I gave him sixty strong shocks, passing them on all parts; he tarried two hours, and was astonished to find, that after using many means, and all to no purpose, with great cost, he was now restored in two hours, with two shillings cost. He called to see me about twenty days after, and asked me if I thought that the shocks had any tendency to remove a dropsy: he said he had grown weary, not only of using means for help, but of even mentioning a complaint which had troubled him for years, and refused any kind of help from all means that had been prescribed by physicians. In a few hours after he left me, he said, he began to make water excessively; I think he said he made nearly a gallon in a few hours, and as the water was void-

ed his old complaint grew less and less, and by the time the profusion of urine subsided, he was entirely well of his old disorder; the sensation of which, as he said, was a heavy load lodged in his bowels, as you might conceive of a cannon-shot; before, he knew not what to call it, but now he knew it was the dropfy. In what part this effusion was secreted I know not; or whether it was voided by some re-absorbency, or whether that is possible I know not. It puts me in mind of what I once read in Doctor Wesley's primitive physic, viz. "Electrifying cures dropfies, supposed incurable." What I have mentioned are the summary of my experiments in the internal dropfies.

It is my opinion that the readiest method of removing a dropfy in the abdomen, would be to extract the effusion by the catheter, and after this is done then you may electrify, merely as a preventative; and I think no one will dispute the expediency of such a treatment, nor have the least doubt of preventing a second effusion. I will affirm, that if a restoration of all the whole round of secretions, and all the various fluids, being duly prepared by attenuation, &c. is sufficient to prevent an unnatural effusion or secretion in the abdomen or any where else, it shall be prevented; but if the patients cannot submit to this operation, they may most certainly be relieved in a good degree, if not totally cured, by electricity.—The method I have pursued in this case, is sim-

ilar with the other; only I have given a greater number of shocks through the abdomen than any other part, but did not neglect to pass more or less shocks in all parts, especially on several of the first days of electrifying.

In electrifying for the dropsy, I have generally given from forty to one hundred light shocks in one day; but after five or six days, have reduced the number gradually. But it must be remembered, that in all cases of electrifying, the age and strength of the patient must be consulted; and further, that in all my prescriptions, I have had invariable respect to adults.

N. B. I restored three of the anasarca at Ballston pool, while they continued the use of the water internally, and it proved a great assistant to the electric shock. The fixed air, contained in the water, being rarified by the action of frictional heat, promoted by the gentle shocks in great numbers, rendered the fixed air more fermentative, and was evidently a great assistant in the reduction of the dropsy. Notwithstanding they had severally used the water several weeks, they were not apparently bettered by it. The same held true of electrifying for ulcers, tetters, scrofula, inflammations of a part, &c. the shocks being conjoined with the pool-water, wrought wonders in clarifying the blood of bad humours in a very short time, much shorter than was usual for electricity to effect the same cures

with or without the assistance of any other means.

I should advise those, at least, who have an internal dropfy, and are disposed to have it treated by electricity, to use the pool-water at Ballston, at the same time; to drink very freely of the mineral, and then, by great numbers of light shocks, to rarify the fixed air taken in by the water. The shock will open all the natural evacuations, separate all coagulated, and accelerate and carry into the circulations any retained fluids. How much more fermentative the fixed air, being rarified; how much more power of operating agreeably upon the fluids, they being sufficiently attenuated,\* and how much more powerful in propelling humours, morbid affections, &c. towards the

\* It is this fixed air, received into the system by the mineral water, that produceth those effects so fatal to people in a consumption. The vessels being languid and obstructed in parts, in a great degree, cannot sustain the action of the fixed air upon the vessels and the fluids in the vessels. The action of the air is not sufficient to attenuate their morbid contents, and so carry them off into the circulation, or else discharge them: but inasmuch as it rallies into action the less obstructed particles till they fall upon an immovable obstruction, they thereby augment the morbid redundancy upon those languid parts; the issue is, nature sinks under what it cannot support. But let the shocks be first given to clear these passages, and I apprehend no such danger. From similar causes, we may infer the presumption of immersing in cold water, and throwing the blood with a strong reflux upon weak and obstructed vitals---let such people escape the cold bath.



proper evacuations ; being by its own rarification pressing towards all the extreme parts, and must promote the action of evacuations in every part. Hence the utility of conjoining this mineral in a dropfy, is so far evident, that it must leave a conviction on the mind of every judicious reader, capable of comparing ideas.

### *Gout.*

THE gout is a very difficult disease to cure. It may be always relieved, and sometimes nearly or quite restored, by the different modes of treating it by electricity. The old practice of giving strong shocks in the gout, is universally discarded; it was a monstrous absurdity, and discredited electricity very much. Exceedingly light shocks may be passed upon the affected part; the design of them is to induce frictional heat, and stimulate the part affected. But a strong shock will dilate and weaken; and this is opposed to every rational intention of cure.

Dr. Cavallo, in his medical electricity, states the mode of treatment lately adopted in England, and which is found to be a valuable improvement in administering for the gout. They place the patient upon an insulating stool, the affected part being covered with one or two thicknesses of flannel, and with a metallic point extract the spark from the part affected; this should be repeated three several times in a day, and continued an hour at each time. But I do

not think it expedient to depend altogether on the extraction of the sparks; but that light shocks should be alternated with the extraction of sparks, the more readily to discharge the irritative contents of the dilated and weakened portions of vessels.

As the gout exists either in direct or indirect debility, high and constant insolutions will be of undoubted utility. The insolution inseparable from the extracting of the sparks, may be, and undoubtedly is of some benefit; but to make this supernatural insolution any essential intention of cure, it will be necessary to perpetuate the application of this invigorating power from day to day: for, notwithstanding it instantly accelerates the circulations, by its enlivening effects upon the fluids; yet it doth not restore, as hath been observed, tone and durable action, but by a secondary effect, not a little similar to the tension acquired by the gentle electrifications, which is described (vide page 67 and 68) as arising from frictional warmth. The extraction of the spark may be considered as having some affinity to these secondary effects of the insolution and gentle electrifications.

I think it expedient for people subject to these paroxysms to attend to these prescriptions, and use the gentle shocks and the artificial insolutions in their best states of health, in order to restore the habit, and prevent the paroxysms. The method, or rather practice of treating this disease so temporarily, or at the term of the

paroxysm, is, in my opinion, imprudent. To prevent one fit of the gout, goes farther towards a cure, than to relieve many.

The gout being generally the production of the over-action of exciting powers, it requires a high degree of exciting powers to reach and effectually to affect the lower degree of excitability: but to raise this degree of excitement by a great proportion of an individual stimulus, appears to me not so agreeable as to use a combination of stimulants, especially those that consist in the various modes of applying electricity. But I do not mean to exclude the assistance of other stimulating powers; but that in extraordinary cases, or violent attacks of the gout, the most powerful of all the other stimulants, viz. opium, should be conjoined.

### *Dysentery.*

I DOUBT not my reader will think me romantic in introducing this disease, to be treated by electricity. I am ready to confess, that in all probability, I should never have suggested the idea of electrifying for this disease, but for the importunity of one man. A certain Mr. Huntington, at Ballston pool, who had been exercised with a vehement dysentery, or bloody flux, for about six days, and in great pain, urged me to give him a few shocks, merely to ease him of pain, (for he had observed the shocks to be almost an universal anodyne.) I, at first thought, refused; but as he was importunate,

I finally gave him about twenty very light shocks, through the seat of the pain in his bowels, to his back; they directly purged him, and eased his pain: but after a few hours, the pain increased upon him: I electrified him as before; it purged, but with less blood than before.— This was repeated three or four times, and he was restored thereby, in thirty hours, or nearly that time: I gave him only one dose of weak laudanum beside. This experiment was useful to me, and many others, the next summer, when that disease prevailed, and was epidemic and very mortal in the towns of Galway, Greenfield, Milton, and part of Ballston. I then resided in Galway, where I had an opportunity of a thorough investigation of the fact; and in about one hundred cases, sufficiently demonstrated, that the gentle shock, taken through the intestines, was an infallible remedy against this disease; which, at that time, resisted almost any other mean; insomuch that nearly two thirds, of infants in particular, fell victims to its fury. I was informed, that not a single child, at the breast, survived the disease, excepting two that were brought to my machine. It was an unlucky circumstance, at that time, that I had no machine but one that was very large; the consequence was, the patients were all brought to me, and some of them took cold in returning home, which procrastinated their cure.

This specific I immediately advertised in a paper printed at Schenectady; but the doctors in the adjacent towns, either never saw it or did not pay any attention to it. But I was informed that Dr. Lyon, near Lebanon pool, accidentally came across one of the papers, and having a machine, immediately tried the experiment (for the same disease prevailed there at that time) and had the pleasure of finding it to be no mistake; for he lost not another patient, but directly cured every one taken with the disease; who, notwithstanding, lost many before he made use of electricity.

These specimens of the inestimable benefit of electricity in a dysentery, may suffice to evince the propriety of using it in all the like cases. I have never known it to fail of making a cure in any one single instance.

My method hath ever been to pass the shocks from about the navel to the back, a little descendingly; sometimes I have given twenty, and sometimes thirty or forty very light shocks in the same direction at one time. The effects that were apparent, have always been uniformly the same in the bloody flux, viz. they would purge directly, and carry off an enormous quantity of blood in the first stool; but the appearance of blood will be less and less every stool, till all appearance thereof totally subsides. The electrification may be repeated twice or thrice a day; but then the number of shocks in one day ought not to exceed forty

or fifty, in any case that I have seen; and these shocks must be so light, that if a well man should take them through his arms, he would not feel them higher than his wrists. Such a degree of the shock, is what I mean to have understood to be a very light, or a gentle electrification. I have mentioned it in this place, because it is of the last importance that it be carefully attended to in this disease: and the more so, if the patient is much exhausted, or in the last stages of the disease, approaching near to death.

Through good fortune, I did not lose any by their taking cold, but it very much endangered some of their lives; wherefore I must enforce the injunction in this place; be very careful of the least degree of coolness. Observe, I do not say cold; that point would be fatal; but if you feel cool in the least degree, you are wounded.

This is the only inconvenience to be regretted, in the using of medical electricity. The blood is attenuated by the shock, and thrown strongly upon the surface, the pores are expanded, and there is no resistance to a cold from the least external coolness. The external temperature ought to be on a parallel degree of warmth with the blood in the vessels, or nearly that. But in five, six or eight days after the shocks are desisted, the pores will begin to astringe, and by degrees resist the approach of cold as before. When a disease is removed,



astringent medicines may be administered to restore the habit in a much shorter time. I have made use of the bark, elixir vitriol, brandy, &c. for bracers, after electrification; but sometimes opium answers a better intention.

The gentle dysentery, white or green purgings in children, are immediately relieved by the gentle shock; it always regulates the digestion. I have given ten or twelve shocks, in this disease, to a child of four weeks old; and that single electrification restored the child to health.

In the epidemic at Galway, I would not use any thing but the shocks, until I substantiated their infallibility, and made it evident to many people, that they were a sure restorative, without any assisting mean whatever. But that I may do justice in every page, and to every subject, it is necessary to observe, that none of these cases were very far advanced; they were mostly recent ones; the patients were all able to go or be carried abroad. If costiveness preceded the disease, a cathartic should be given; for the shocks are not a laxative, in the sense of a cathartic, but only a propellant of laxative contents; and that by springing the intestines, the blood secreted in the intestines will be discharged, and a further effusion upon the intestines will be restrained; but without a purge, costiveness may remain, to the detriment of the patient.

There may be a combination of complaints, in this or any other of the diseases I have mentioned, to be treated by electricity, which may make it necessary to vary the manner of treatment by electricity; to conjoin different assisting medicines, &c. &c. all of which, must be left to the observation and judgment of the electrician, physician, &c. The strangury, that so often accompanies the vehement dysentery, is always removed by passing a few light shocks down the urinary passages.

*Cholic.*

THAT which consisteth of flatulency and wind, is relieved by passing the shocks through the bowels, in the same manner as for the dysentery: some of the last shocks should be brought on as high as the breast, about midway, and passed down to the lower part of the spine. These shocks being passed from above the region of the stomach, will prevent puking; which will sometimes take place, if the shock is passed altogether below the region of the stomach. Shocks given in this direction will purge, in the same manner as they will in the vehement dysentery. I have given from ten to forty shocks, on such occasions, and they have given all the relief that was necessary, in the most of cases; sometimes I have added an internal stimulant. When this disease is conjoined with vomiting, the shocks must be brought on as high as the sides of the neck, and

passed down to the lower part of the spine, or back-bone; it will immediately check the puking, and purge very freely. People that I have electrified in this disease, some years past, tell me that they have ever been less troubled with that complaint since the electrification, than what they were formerly.

I used the shocks on one man, at Galway, whose life was almost exhausted in one hour. It was a tremendous discharge of blood, both ways, I directed the shocks as just now described, and the effect was an instant cessation of vomiting; but purged severely for a minute or two. I rallied his strength with a dose of opium; and a little of the bark put him on his legs very soon.

The cholic that is attended with costiveness, must be treated very differently. The shocks effect nothing in diluting the dense feces; moreover, it is imprudent to pass many shocks on the intestines in this situation; the consequence is, that the elasticity of the shocks irritates the intestines, by springing them, while their contents are in a state so capable of chafing and wounding this part, which, of all the system, is supposed to be most irritable, and most easily inflamed. Wherefore, all the use that can be had of the shock in this case, is, to accelerate the operation of the physic, when there appears to be any difficulty in its operating. It is of great value in this particular case. Any person that only knows that gesticulation

quicken the action of an emetic or cathartic, will want but little argumentation to convince him that the gentle shocks claim a very great ascendancy over any kind of gesticulation that any person may be capable of. Moreover, it is most commonly the case, that people who need these helps, are not capable of action, or gesticulation, in any degree that will essentially affect the operation of physic. Hence electricity claims considerable merit in this particular respect.

When it appears necessary to use electricity with an intention of forcing the action of a cathartic in obstinate cases, the proper method will be, to pass about eight or ten shocks at one time; and if the case is urgent, or the circumstances of the patient demand immediate relief, to repeat about the same number of shocks, once in twelve or fifteen minutes, till the physic shall operate. The physic may be given about fifteen minutes previous to the first electrification.

When there is any difficulty in keeping an emetic or cathartic in the stomach, the shocks being passed from about midway of the os iterum, or breast bone, to the lower extremities of the spine, will prevent their coming up prematurely—the shocks turned down the peristaltic motion. It is impossible, however, to prevent, if it were necessary, the action of an emetic by giving the shocks downward; but its emission from the stomach will be rapid for

a short time, and then it will act cathartically. I have frequently known a dose of emetic tartar to produce all this in five-and-twenty or thirty minutes, by the assistance of thirty or forty light shocks: but in forcing the emetic to throw up from the stomach more powerfully, I have passed the shock from just under the region of the stomach to the side of the neck: When this action was sufficient, I would turn the shock downward, as before mentioned, and it will purge in a few minutes, &c.

### *Asthma.*

I AM not certain that this disease can be finally cured by the shocks. But one thing I am very certain of, and that is, it will give instant relief in a fit of the asthma, and will throw it off for that time. My experience goes no further than just to understand thus much of the use of the electric shocks, in this case.

One person, who had been constantly troubled with this disease for years, was free from it almost entirely during one year, by taking about thirty shocks at one time. The circumstances have always been such, that I have had no opportunity of making a thorough experiment: Moreover, the great difficulty there will always be, till people grow more rational, to persuade them to that degree of precaution that would be necessary to make a fair experi-

ment, or finally to determine whether a process of electrification would avail to establish health. Without the most scrupulous attention, many colds would intervene, and would render all attempts to effect a cure absolutely abortive.

The manner of electrifying in this case is, to pass the gentle shocks from the right shoulder to the left side, just under the left arm: about fifteen or twenty may be given at one time; but sometimes less will suffice to throw off a fit of the asthma.

This is a case that merits a treatment by the artificial insolation. If any person hath leisure and abilities to make the experiment for a few months, I doubt not but that they would find their advantage in so doing.

As electricity seems to be the last and only resort to which people can apply with any hope of ultimate success, in this disease, it would seem prudent to give it a fair trial. I think a lengthy insolation, alternated with the gentle frictional electrifications, would at least go very far in removing an asthma, as well as many other cases of obstinate debility. To make the experiment in a proper manner, will require an insulating bed, or a bed standing upon glass, that the patient may sleep in the plus electrification, and not depend on what may be performed in the day time only.



*Diabetes.*

THIS disease hath been, and is yet, very often fatal under ancient practice. The old method of treating it by absorbents, is now totally discarded, excepting by a few obstinate antique practitioners, who value their antiquated education more than the lives of their patients; who are too wise to learn any thing, and, I had almost said, to know any thing. But, happily for mankind, it is now known to be easily removed, by treating with diffusibles, such as promote secretions, perspiration, &c.

The excessive action of the kidneys in secreting urine from the blood, is removed or prevented by promoting the secretion of the perspirable vapour: and if you have nothing that will produce this effect easier and quicker than the electric shocks, you may use them, and they will answer the purpose; or if all other means prove ineffectual, yet will not this mean. The shocks may, and must be passed in every part of the system daily, till the disease is removed, and health restored. About forty shocks may be daily given; but they must be of the moderate kind. When this disease is suffered to remain long, indigestion will be very likely to ensue, and costiveness, which will require some other aid to remove, besides electricity. But, even in this state, it is not always safe to depend on physic altogether: it will sometimes prove fatal; as also in a dry bilious cholic. In this

situation, recourse must be had to a peculiar diet, and that of the soluble kind, such as meat broiled on fire-coals, and mutton broth; and, in a desperate case, the entrails of a sheep, boiled to a pulp-like consistence, and with a trifle of salt, will answer an excellent purpose in healing, sheathing and promoting, and inducing an easy action in the passages, and will make a repetition of cathartics unnecessary. But what is the ultimatum of treating a confirmed state of costiveness with common purges? True, they grant a temporary relief, but with more and more difficulty, as the repetition is made; and that, because they diminish the already too scanty nutriment of the system. This general deficiency effects a particular deficiency, at least sometimes, of bile, pancreatic juice, gastric fluid and saliva, a due degree of which are necessary to support the digestion. The discharge of the digestive fluids into the stomach, duodenum, &c. may be promoted by the shocks; but to continue a diminution of their source is imprudent: A better method appears to be, to supply the most nutritious food possible, and that of the easiest digestion, soluble and healing to the bowels, such as is above recommended, with brandy and molasses for constant drink. Let this regimen be constantly observed, and gentle shocks repeated daily, till the patient is restored to health from a diabetes, or confirmed costiveness in.

any case. This case demands particular attention to a steady degree of warmth.

*Urine suppressed—bloody and hot.*

I HAVE used the electrical shocks in all those different states or stages, and have known of no single instance of failure of immediate relief, or of relief in a few hours, and always terminated in a radical cure. The manner of passing the shocks has been from about midway of the spine, or back bone, to the inside of the thigh, so as to bring the shocks down the urinary passages. Some shocks may be passed through the lower belly to the back, about ten in each direction; and if the case is urgent, they may be repeated twice, and sometimes thrice, in one day.

Some European authors have recommended the shocks in the gravel; but this, I think, must have been a mistake, such as I have, in my first practising in electricity, made myself. People have applied to me for assistance in the gravel, as they called it; but I have restored many such gravels by fifty or sixty light shocks, and might have had the reputation of working what would have been, to a man of skill, a miracle: but I immediately told my patients, in these cases, that it was no gravel, but a strangury, after I had once discovered my mistake; and such hath been the mistakes among those European electricians. Notwithstanding, I think it adviseable to electrify in a gravel, in order, at least, to prevent an increase thereof,

and to suppress irritation and inflammation. Moreover, the shocks may be of further use; they may be necessary to pave the way for voiding the gravel from the bladder of urine, not only by removing irritation from the bladder and urethra; but also, by expanding or dilating the urethra, the passage is rendered more capable of carrying off those dense bodies. But to suppose the shocks to act as a resolvent upon the gravel, is to me unaccountable; and I am determined to assert nothing for a fact, in this book, but what my senses have been witnesses to; what is but conjecture, I have explained as conjecture, offered my reasons, and submitted it to the judgment of mankind.

Although I cannot believe that the electric shocks act as a resolvent on a consistence so dense as these bodies are known to be; yet I am convinced, from very many instances of demonstration, that they are an infallible diuretic, as well as a diaphoretic. I know it is unaccountable, yea, and laughable with some people, (who, by the way, are totally ignorant of the whole matter) that the same medicine should be represented as capable of producing contrary effects. I have prescribed the electric shocks for the diabetes, or an excessive evacuation of urine:—now I am recommending the same medicine as an excellent specific to restore a deficiency of urine. “We are not acquainted with such specifics, nor such contradictory prescriptions!” Very well; neither have you

been acquainted with medical electricity. This is that mantle of charity I have cast over the faculty, (vide c. 2, p. 62.) Nothing but a want of information on the subject of medical electricity, can exculpate physicians from a crime, dark as the grave, and horrid as murder! But there is no contradictions in my prescriptions of this specific, of its being capable of removing a diabetes, by duly mixing the substances of the blood, and attenuating the fluids generally, and affecting the whole round of secretions, and promoting a due degree of action upon them all; and consequently of secreting the perspirable vapour. These united productions must check a profusion from the blood in the kidneys, and so restore a diabetes. And as to suppression of urine by strangury, irritation or spasm, or any kind of obstruction (excepting the stone or gravel) either upon the ureters or the urethra, the dilation of the shock, its attending effect, is equal to the removal of obstructions of one description; and its stimulating frictional warmth and rarification is equal to another. And as to a deficient action in the kidneys, in secreting from the blood a due quantity of urine, this is again a deficiency of secretion; and the same remedy that cures a diabetes, by acting upon the secretory vessels, will also, by the same actions, restore a deficiency of sensation in the kidneys. I am not the only one who has discovered the power of the electric shocks, over a deficiency of

secretions. Dr. Cavallo asserts, that the shocks promote secretions universally. Certainly they must have this effect, inasmuch as they do mix, attenuate and rarify the whole mass of fluids, and, at the same time, expand and dilate the minute vessels, every where in the system: being conducted, as hath been demonstrated, through the vessels every where, in every part where there is fluids to conduct, this subtile effluvia will fly and expand, dilate and attenuate upon the whole mass of fluids, and thro'out the whole vascular system. Who can but exclaim, what a mean of health! what a preservation of life has been ignorantly prostituted to mere amusement!

N. B. I have been credibly informed, that when a stone, which had been extracted from the urinary bladder, had been put into a vessel of Ballston pool water, or that of Saratoga pool, which is similar, that the mineral proved a resolvent upon the stone, and dissolved it in a short time: but there is need of caution in using the water in such cases. During a summer which I spent at Ballston pool, a man living in that place asked my opinion concerning the use of electricity, and of the pool water, for the stone in the bladder: I replied, that electricity was useless, and that the mineral was such a powerful diuretic, that I thought there was danger of pressing the stone into the neck of the bladder, and might have a bad tendency; at any rate, the water ought to be used mode-



rately. He said some doctors had advised his father to the use of the mineral in that case, and to drink all he could of it, and his father had come to his house to try the experiment. I again cautioned him to use it moderately at first; for I was very certain there was danger of a very free use of so powerful a diuretic, in his father's situation. But it appeared that his father followed the counsel of his doctors: he drank some quarts of the water, as I was informed, in a very little time; I think in about one hour; but it proved true that the stone was pressed into the neck of the bladder, and no means could be found to resist it. The man continued a few days in great agony, and then expired. I have mentioned this fact, for a caution to any person, who may apply to the same mineral in a similar circumstance, that they use the water but very moderately at first, and take time to make the experiment in a more judicious manner.

*Menses obstructed, &c.*

A SUDDEN obstruction from cold, or any other accident, may be restored, most commonly, by a single electrification. About forty shocks, of considerable force, in a firm constitution, have often given complete relief: they should be passed, some through the uterus from the fore-side to the back, some from the back to the inside of the thigh, and from all round the waist to the feet. I have known this ope-

ration, in a sanguine habit, to give relief before they left the machine.

But in a penury of blood, languor, deficiency of excitement, &c. the case is quite dissimilar, and requires more patience to restore: It calls for all the mental and animal stimulants or application of remedy to be made, both to body and mind, in some particular cases. If it is caused by disappointment in love, intense grief, causing a dejection of spirits, the application must be made to the mind, if possible. If the object of desire cannot be obtained, the unhappy sufferer should be removed to a place and company, where there is no knowledge, no mention of his name; she must not be suffered to live in the house, nor walk a road where she had ever enjoyed his company. These precautions and necessary pre-requisites being attended to, let her have lively company, frequent entertainments and amusements, often riding on horseback and in carriages, generous wines, nutritious soluble diet, and, if they can be had, frequent insulations; and, to make a completion of cure, let her be electrified, but very lightly, in the same directions above named, and repeat it from time to time, but especially at the periodical times, as high as may be, that the artificial effort may join hand with the natural, in producing the desired effect.

When a dejection of spirits hath had no hand in inducing a suppression, &c. there will

be less difficulty in the cure. Dr. Cavallo, in treating of this case by electricity, speaks very confidently and emphatically; and intimates, if I remember right, that there is no failure of cure, under a proper treatment, by the electric shocks. From what I have observed in a long practice, I have reason to believe that very few, if any cases of partial, or even total suppression of menstruation, would be able to resist the power of the shocks in remedying this complaint: but when it has been of long continuance, more time will be occupied in establishing a due action in the part; indeed, the intention of cure must be directed to the whole system, to increase the vital stimulus of blood, to enliven the mind, and animate the functions both of body and mind, as much as possible. The electric shocks keeping the fluids duly attenuated, and every passage of evacuation open and free, the establishment of health will be complete, as soon as the quantity of vital stimulus is sufficiently increased.

If the supernatural insolation is of any use in any case, no one will doubt the propriety of making use of it in this: It appears to me, to be peculiarly adapted to assist in this deficient action. There can be no doubt, but that an agent so invigorating, so stimulating and enlivening to the motion of the fluids, must, by a suitable application and continuation, produce a very valuable effect in removing a state of deficient excitement, and in establishing health

from any disease which hath originated or doth exist in debility, either of the direct or of the indirect kind.

*King's Evil.*

I MUST intrude my catholicon upon the stage a little longer, that its abilities may be further exhibited: nor shall I blush to own, (and that in the face of those who say, a medicine that is good for every thing, is good for nothing) that there are several diseases not yet named, in which electricity is an admirable specific. If you can find nothing more fashionable, or infallible, in curing this scrofula, than the electric shock; or if you can stoop to a mean so simple, and but little in fashion and estimation; or if you will not be ashamed to obtain your cure so cheap and easy, then you shall be directed to an infallible cure. First, the part on which the shocks are to be applied, must be warmly covered, and that steadily continued until perfectly well. The shocks must be passed through the seat of the disease: they must be, at least some of them, smart shocks, in order to separate the coagulations, accelerate the contained fluids, and dilate and open the passages, that so the circulations may be again performed. I need not say much on this head; only that the part be kept warm, and indeed the whole body, and about twenty or thirty shocks daily to be given from just above the seat of the disease, and passed down to the

feet. I would have them passed to the feet, that the whole mass of fluids may be clarified, and that there may be no danger of any sudden return of the disease. Continue this daily till well.

### *Cancers.*

A GREAT part of the world of mankind have been busied in combating cancers : thousands of nostrums, and infallible cures, have been invented ; and almost any body you meet on the road, can prescribe a certain cure for this obstinate and dangerous disease.

It is not my intention to advise any body to throw away any infallible remedy, for electricity ; nor any valuable specific, that may aid or assist in the cure ; nor absolutely to believe that electricity can cure all sorts of cancers, without the assistance of some other medicine.

But as it so happens, that among all these nostrums, and infallible specifics, some people are so unfortunate as to fall victims to this disease, I hope I may be pardoned in recommending electricity to those who are employed in the art of healing, as a very valuable assisting mean ; and I had almost resolved to set it as high as a bunch of roots and herbs, and so to call it an infallible cure for cancers. But there is a difficulty in monopolizing it as a nostrum ; every body will know my medicine, and the whole world will turn quacks. I may

as well divulge the secret, and let my neighbours have the benefit of it, if there is any to be had.

It will be readily conceived, that if the electric shocks do, in their action upon fluidities, vessels, &c. separate the coagulated particles of blood, accelerate the retained fluids, and dilate and open the passages, that they ought to be esteemed one of the most valuable discutients on earth : not only because they are the most powerful ; but from a consideration of their being as easily applied to any internal part, as to the external. This gives them an infinite preference to any other discutient known in the world.

The utility of the electric shocks, in discussing a scrofulous tumour, or virulent sore, is so obvious, that I need not use importunity to persuade any person to put it to actual experiment.

The method I have made use of myself has been, to pass the shocks through the seat of the cancer, to repeat the electrification daily ; or else, once in two days, to give sometimes ten, twelve, fifteen or twenty shocks each time. About one shock in twenty should be raised to a strong degree, the more surely to discuss and carry off the retained fluids, and thoroughly to break up the seat of the humours ; but the remainder of the shocks may be light. The strong shocks will separate the coagulations, and dilate the passages ; and the rest,



being light, will be sufficient to propel off the morbid humours.

In electrifying for a cancer, as well as for a king's evil, it is best to pass many shocks through every part of the system, and thoroughly attenuate the blood: keep the body continually warm, that the perspiration may not be interrupted, but that the humours may be cleansed, and the blood totally clarified of the scrofula.

If the cancer is in or about the head, then the head must be warmly covered, and the face, so far as to keep it in a perspiration. Do not dream of making a cure, unless these instructions are rigidly attended to. Do not say, as many will, "I am not apt to take cold." This has been the eternal disgrace of electricity, and will continue so to be, unless people can be persuaded to be all attention, to be continually upon their guard, that not the least degree of coolness approaches them for a moment.

I have used electricity on several cancers: the first was on myself. Suffering much pain, by various applications, and all to no good effect, I began to despair of a cure: But, having observed the effect of the electric shocks upon other kinds of sores, after some reflection, I was determined to make the experiment on myself. (This was about the first of my practice.) Accordingly, I took fifty very light shocks, directly through the cancer; after-

wards I took about twenty daily, mostly very light. This I continued ten or twelve days : Then I desisted as many more days ; by which time I saw the cancer was nearly well ; and I have not been troubled with it since, which is about eight years. But this application was made in three or four months after it was discovered to be a cancer.

The second case was a young man from Albany, whose name has slipped my memory. He called on me at Ballston pool. He had what is called a spider, on his face, but a recent one: its head was not larger than a pea; but it was evidently a cancer, from the symptoms of sympathy, which he said were like a stinging, darting from its seat round about his face. To be short, he was electrified a few times, and it totally disappeared, and every sensation of it.

The third was a lady, on a visit from the city of New-York, to her friends in Claverack. Hers was of the former description, only about the size of a large bean, accompanied with the former symptoms ; and was a cancer, in the judgment of different physicians, who had seen it in New-York. While she tarried, I electrified it three or four times, on different days ; and it was almost reduced before she left the place.

I have electrified several others in an accidental manner ; and the shocks always abated the irritation, smarting, and uncomfortable sensations of the cancer : But not having an

opportunity of making a thorough trial upon those that were bad, and were very malignant, I cannot avouch for the ultimate effect of electricity, in all cases and stages of a cancer.

Doctor Cavallo, in his medical electricity, states the treatment of a very bad cancer, on the breast of a woman, in England, which resisted all medical aid for a long time, and was like to prove fatal. At length, a certain gentleman proposed to try the experiment of treating it by electricity. Accordingly, the trial was made; and the consequence was, that the sensation of pain immediately abated, the cancer discharged freely for a time, and the parts began to contact and heal; and, when Cavallo wrote, the cancer was (and that contrary to the expectation of the gentleman who attended it) likely to get entirely well.

I have not that author's writing by me at this time, or I would copy their manner of treatment, by electricity. Cavallo mentions their extracting the electric spark from the cancer, which proved very beneficial: But they discovered an essential difference between extracting the spark a by steel point, and by a wooden one. The wooden point, if I remember right, would irritate,\* or in some manner would leave a disagreeable sensation, which did not facili-

\*If the wooden point tended more to irritate and inflame the part, surely it would be the best instrument to extract the spark by, when it is intended to promote inflammation and suppuration.

tate, but rather backened the cure; but the steel point was quite different, and had a very salutary effect upon the cancer. These points must not be sharp.

But I cannot discover any cause for the extraction of the spark producing any effect more conducive of cure, than the gentle shock. The action of extraction springs the muscle whence it is extracted, and consequently accelerates the motion of the fluids in that particular part; and so will the shocks, in a manner, as I think, more agreeable: For, let the spark be extracted by what instrument it will, it doth tend, more or less, to inflame the part: And if the promotion of inflammation answered any good purpose, then the point that was most conducive of inflammation, would have had the best effect; but the contrary of all this proves true, by their own confession. Wherefore, it is the gentle shocks, or these chiefly, which produce the valuable effects not only on all kind of malignant ulcers, (which Cavallo asserts they will heal) but also on cancers.

There is another method of using electricity, not yet mentioned—a method I have invented for healing of sore and inflammatory eyes, and some other slight complaints; and that is, by blowing what I have named the aura, upon the part affected. I have named it aura, because its appearance resembles the aurora-borealis, or northern light, or the appearance of the tail of a comet. The sensation of it is

cold, as a cold northern wind, when it falls upon any part of the naked surface of the body, and is luminous. I have blown it upon a burn from a hot iron; and it hath immediately eradicated the fire from the part. I have used it on the eyes, when sore, and having a sensation of being filled with sand; and it gives relief in one minute.

I have never used it upon a cancer that was corroded, nor on any other; though, from its effects on sores, I think it may answer a valuable purpose: but inasmuch as the part must be uncovered, in order to make the application, it must be done in a warm, very warm room, especially if it be within a few days of the person's taking shocks, or else they will take cold by being uncovered.

The manner of performing the operation is thus: Take a metallic rod, or the largest kind of wire; let one end be brought to a point, and the other end, by a hook, connected with the prime conductor: the pointed end must be brought within an inch, or two inches, of the part on which the aura is to be diffused. If the operation is to be made on the eye, great care must be had that the point is not struck into the eye: the person's head must be steadied by a careful hand, and spectators kept at a distance from the operator. It will often make a person sneeze; on which occasion they must be cautioned to throw their heads on one side

of the pointed instrument. When this is blown upon an eye, it will cause the lachrymal to discharge freely; this is supposed to be done by the astringency of the aura, in contracting the parts.

It may be observed, that the aura is not an expansion of elementary fire, but so great a density, as to render it cold; which is one reason of my supposing cold to consist in a density of elementary fire.

After the body of humours in a cancer is sufficiently discussed, I think it is probable that the aura, diffused freely upon the part, must contribute considerably in cleansing and healing the fore.

The aural diffusion is kept up by a continual turning of the cylinder, or constant promotion of friction. The machine should be large: Best of all to be carried by water-works.

A cancer that is thoroughly formed, and virulent, will require some months to complete a cure; wherefore, much patience must be exercised by the operator, as well as by the patient.

N. B. I should have mentioned, that the pointed end of the aural rod (for so I call it) must be supported by a goose-quill, either bent round the rod, or the rod inserted through the end of the quill, a waxed thread being first drawn lightly round the end of the quill, to prevent splitting quite to the end. The fire, or effluvia, will not pass off upon the quill; and



the quill may be taken in hand, within two inches of the rod, and held to the part intended.

### *Quinsy.*

THE electric shocks are an effectual and sudden cure for the quinsy. Bring on the shocks a little above the affected part, and pass them down to the lower extremities. If it is done in the first stages, they will carry it off at once: If in the last stages, they will break it immediately, by the dilation of the shocks, striking into the suppurated matter.

I have used the shocks frequently on the quinsy, and have ever found gentle shocks to answer the purpose; and the shocks hardly ever need repeating more than twice or three times: ten or fifteen are sufficient for one time. Let the part be covered.

Sore throat, inflammatory sore throat, canker, &c. in the throat and bowels, may all be assisted, and finally cured, by gentle electrifications through the part, and covered warmly.

### *Vertigo.*

VERTIGO, or swimming in the head, proceeds from a redundancy of blood, caused by the over-action of the ascendens aorta. To prevent or cure, let strong shocks be passed from the sides of the neck, quite down to the feet. The shocks will restore an equilibrium of the circulations, and throw off the redundan-

cy from the head. Six or eight pretty strong shocks are generally sufficient to effect this.

*Head-Ache.*

HEAD-ACHE may proceed from several causes: from compression of a part; from irritation of the nerves; from a foul stomach, and from a redundancy, either with or without universal inflammation. When it proceeds from a redundancy, it may be cured as vertigo, just mentioned. If it proceeds from compression, it may be helped by passing shocks through the head, to the feet. If it proceeds from irritation of the nerves, it may be helped by giving a few light shocks upon the nerves universally, down the back of the head, to the feet, &c. and repeated once or twice in a week, for six or eight months. This will be as short a time as may be expected, to remove a pain in the head, commonly in the brain and back part of the head, proceeding from nervous irritation. If it proceeds from a foul stomach, a puke is the best remedy.

There is a periodical head-ache, which will commence with the rising sun, and continue till it is past the meridian. This I have several times cured, when it had continued for months, and had become very tedious: indeed, I have never failed to cure the pain in a few hours, by fifteen or twenty pretty strong shocks, from the head to the feet. Sometimes the original pain will be removed; but the patients,

by taking cold, will have a pain through the whole head, and will suppose the shocks have done them hurt; but after the cold has left them, they have found their heads well enough.

### *Deafness.*

WHEN deafness is caused by colds—by a retention of the cerumen auris, or ear-wax, in the glands of the ear, causing a rigidity, dryness, hardness, and consequently an imperceptibility of vibration of sound upon the membrana tympani, or obstructs the communication to the interior membrane of the auditory nerve, all which may happen by a deficiency of secretions in the glands of the ear; or if it is caused by torpor, compression, &c. on the auditory nerve; in all these cases, electricity may be supposed to be useful. It is useful to remove the cold that causes the deafness: it is useful to promote a discharge from the glands of the ear, and thereby to bring on moisture on the drums of the ear, and consequently a susceptibility of sound; and, in case of torpor on the auditory nerve, to recover a sensibility, or remove compression, inaction, &c.

Before a single shock is given, let the head be warmly covered; then light shocks may be passed through the head from ear to ear. Ten, fifteen, or twenty light shocks may be given in one day, and continued till hearing is restored. After electricity is desisted, wash the head with brandy, daily, and leave off the

covering of the head by little and little, lest the person take cold.

Sometimes, there will be a stoppage in the ear, by a dense body of ear-wax: The best method to remove this, is to syringe with warm water repeatedly, and stop the ear with black wool.

### *Inflammatory Eyes.*

I HAVE always had great success in treating inflammatory eyes, with very light shocks, passed from all round the eyes, to the back of the neck, and some passed down to the feet. I have given forty, fifty and sixty in one day; but they were almost imperceptibly light.

The aura is of singular use in this case also. Any person using the electric shocks upon their head, and especially upon the face, must absolutely keep in the house, or be blinded with covering over their faces, when they go into the air.

I restored a daughter of General Patterson; who had been blinded totally with inflammation; it occupied but five or six days, during which time, I used the gentle shocks, and the aura twice a day. It was not more than six days, before her vision was able to receive the brilliancy of meridian day with ease, and perfectly transparent.

### *Film.*

I HAVE intirely a new method of removing a film, or rather of suppressing inflammation,

that hath so embarrassed the removal of films from the eyes. You will suspect I make use of electricity to effect this suppression of inflammation, since I have recommended it as an excellent specific in removing inflammations from the eyes.

There are many methods of operating upon the film; but vain attempts to suppress inflammation have been the disgrace of the practice. But that difficulty is now to be surmounted: electricity, by the gentle shock, and by the diffusion of the aura upon the eyes, is the agent to produce this effect. It must be used in the same manner, and under the same degree of warmth, as prescribed for inflammation in the eyes. Purges, in some cases, are useful, and it is expedient to adapt the regimen to the common method in all such cases.

I have commonly used the luna caustic, but would electrify one day at least before the application of the caustic; sometimes I have touched the eye lightly, twice a day, and gave a few light shocks soon after, and sometimes used the aura: by this process, a film may always be removed, and the inflammation kept off, or it will be but temporary, existing a little time after each particular application of the caustic to the eye.

*Gutta Serena.*

HAPPILY for mankind, a remedy for this kind of blindness is now discovered, and very generally known in Europe, if not in America.

Wesley, Graham, Cavallo, Lovett, and all that have had any considerable experience in electricity, are high in the opinion of its usefulness in the gutta serena, and in blindness from some other causes. Wesley writes of a cure of blindness by gutta serena, of twenty-four years standing, performed altogether by electricity.

I am not fully convinced that the same degree of transparency can be induced, that was natural before the blindness happened, especially when the blindness has been of long standing.

That I may reflect the most light on the subject in my power, I will briefly relate my successes in the treatment of several cases of blindness, by electricity; and if it appears that my statement of facts contains any exaggerations, any person is welcome to rectify my mistake, in this or any other instance, in the public papers.

There are many cases of partial blindness that I have restored, which would be too tedious to mention; and several I shall not mention because I cannot recollect their names and places of abode.

The first I shall mention is Henry Barager's case, who belonged to Kinderhook. His blind-



ness was induced by a surfeit ; his case was a little singular : he had flashes of light, something similar to what a person experiences in a dark night, from flashes of lightning, which helped him to find a road, but with some difficulty : his vision was a specimen of the state of his mind ; he was wild, incoherent and bewildered. The first application for his relief, was made to Dr. Bartrop, an eminent physician from London, in England, but now lives in Kinderhook, on the river Hudson. The doctor, after examining his case, told him the most likely means to help him would be electricity ; and as his own machine was out of repair, he advised him to apply to me at Chatham ; he accordingly came to me, in the situation before described.

I electrified him twice a day, by passing about twenty light shocks from round about his eyes, and from every part of his head, to his feet, or lower extremities. This I repeated three days, and in about six days it terminated in a complete cure of his blindness, as well as the disordered state of his mind.

A Mr. Burhite, of Schodac, two miles from the Hudson, eighty-three years of age, totally blind three years : as I was in business within a few rods of his house, at Miches-kill, having said something of the use of electricity in cases of blindness, Mr. Burhite's state was mentioned : I proposed to try the experiment ; but the people viewed my undertaking as a piece of

presumption and folly, he being blind by great age : the second operation I made, however, gave him a view of objects nigh at hand, and a third one enabled him to walk without a guide : his wife told me that he could distinguish the hoops of a churn that stood on the opposite side of the room, and could take the tongs and light his own pipe, which relieved her of some trouble.

In a little time after, he rode ten miles to me in a sleigh, to obtain another operation by electricity, which was much to his damage ; for in riding home in a cold day, notwithstanding his covering, he took a severe cold, by which he nearly lost his sight again, as I was informed, but I have not seen him since I made the last operation upon his eyes.

John Smith, of Chatham, about fifty-five years of age, could not see to read, but could find a road : I treated by electricity, as in the other cases, for seven or eight days, when his sight was rendered so transparent that he could read the smallest print ; and he was about to send the glad tidings to his family : in the presence of one of his neighbours, he called for a fine needle and thread, that his neighbour might be a witness to his wife of the absolute betterment he had received ; when he, without any difficulty, threaded the needle.

George Alger, of the same town, aged about fifty-five years, was relieved from an opacity of vision, about the same time.

A wife of Mr. Carter, Salisbury, state of Connecticut, was nearly totally blind of a gutta serena, and that of the worst kind : her eyeballs red and inflammatory, were, in about thirty days, restored almost to their former state of transparency, especially one of them ; (for the other eye was damaged, by too much air on the side of her face, at a particular time) she could distinguish a man fifty or sixty rods distance ; but my business in other places was so urgent, I could tarry with her no longer : I left her with a view of completing the business at another time ; but, notwithstanding all the caution I could give her to avoid the air, she was persuaded by some of her neighbours to ride a few miles ; she gave way to their importunity, rode out, took a very bad cold, and almost lost her sight again. I have mentioned these disastrous effects of taking air too soon, that others in the same situation may learn to fear and avoid such destruction.

The wife of David Ring, of Chatham, and daughter of Mr. Bunker, packer or inspector of provisions, of Hudson, and on the river of that name, twenty-eight years of age, could not see to read at twelve years old, by reason of dimness of sight ; she was totally blinded. I used the gentle shocks upon her eyes, a few days, and she began to discover objects pretty clearly ; she could observe the shadow of a cat on the floor : but getting possessed of the notion that she must ride to Hudson, six-

teen miles, on a pleasant day, to visit her friends, especially a sick sister, was met, as she entered the town, by a violent storm of thunder, wind and rain, all in her face; very soon a cataract fell into one eye, and with much difficulty, I was afterwards enabled to keep the other eye in a state whereby she could perform business about house.

These women being at home in their own families, as soon as their sight was bettered, could not be restrained from taking too much light, from viewing objects too minutely, were possessed of too much attention to business, which they ought totally to neglect. But in spite of all these obstacles, they received betterment, as above described. I was myself reprehensible, in some of the first instances, in not guarding sufficiently against light and cold, by which means my patients sometimes suffered. To be plain, it was long before I could learn the absolute necessity of avoiding the most trifling degree of air or coolness; and after I had been sufficiently taught it myself, I have often found it difficult to convince my patients of the truth of it. They have commonly learnt it by experience.

When gutta serena is induced by an opacity, or vitiated state of the aqueous, vitreous and chrysaline humours, thereby intercepting the refractory rays of light upon the retina; the gentle shocks, passed upon the organ of sight, clarify these humours, and render them

transparent, and so admit the rays of light to fall upon the retina; and vision is restored: but when by inflammation, or the over-action of light upon the optic nerve, there is an insensibility, torpor, compression, or a decay of the optic nerve, the case is more difficult, and it may, in some instances, be impossible to restore vision, especially from a decay of the nerve; and perhaps the optics may be so wounded by a violent inflammation, as to prevent a restoration to sight.

In electrifying for this species of blindness, Dr. Cavallo directs that the shocks be passed from the back part of the head, to round about the eyes: at first thought I could not approve of that direction of the shocks, because the shocks determine the fluids in some degree, and the morbid affections, in the same direction in which the shocks are passed upon the system: but when I considered that the evacuations from the head were in the fore part of the head; and that, notwithstanding the quantity of humours might be increased in the first instance, about the eyes, &c. yet they were driven towards their proper evacuation, and might be sooner voided, than they could be by a contrary direction of the shocks.

My method hath been to pass the shocks mostly from the forehead, and round about the eyes, to the feet, in order to propel the opaque particles downward from the humours of the optics; which also tends to throw them

off by external evacuations. But should I in future pass the shocks through the head, or some of them, I shall pass them from the back part to round about the eyes.

The number of shocks, in one day, may be from eight to twenty; but in general they must be such as I have described to be the gentle shocks.

I have used the aura in those cases; but could not discover any benefit from it. Drawing the electric spark from round about the eyes, may be of some benefit; but I suppose the gentle shocks supercede the necessity of that operation.

Sometimes the vision will become so suddenly transparent, as to make a dark room necessary for the patient; and to be continued in it in the same manner as for couching or extracting of a cataract.

I am not able to determine, from all my practice in electricity, and treatment of many more cases than those I have mentioned, whether any case of total blindness, by gutta serena, can ever be so removed as to obtain original clearness of vision. So many improprieties and accidents have attended almost every case in which I have been employed, that I have not had an opportunity of ascertaining the ultimatum of a fair process. But this I am able to aver, that I have used it in no case of gutta serena, (except one for six days, blinded by a tremendous inflammation in the head and eyes



for months) without inducing sensible betterment, and that in proportion to the length of time I have attended.

The loss of sight, to any individual, is a loss so irreparable by any thing else in creation—the situation so gloomy and comfortless, that I have spared no pains on this topic, to reflect all the light in my power, to facilitate and familiarize the subject, in hope that it may be (and I am persuaded it will be) a lasting benefit to my fellow-creatures. All that remains to be urged, in this case, is, that people take warning, by the instances above recited, of the imprudence of people, when using electricity in such critical and important cases—that they learn wisdom from others experience in folly. To be short: during the time of electrifying the eyes, and for ten or fifteen days afterwards, the head and face must be kept in a gentle perspiration, or blood-warm. In order to prepare the patient to bear the air sooner, you may give a few doses of elixir vitriol, the bark, &c. and wash the head and face in brandy frequently.

N. B. It will be observed, that I have denominated that blindness induced by great age, to be a species of gutta serena; and, by the way, this kind of blindness is most easily removed. Observing this circumstance, in the course of my practice, hath caused me to say, that it was probable the time would arrive, when electricity would be in such general use, and so well understood, that there would be no

use of spectacles—that electricity would supercede the necessity; and that blindness by age would not, or need not be known.

*Cataract.*

THE electric shock cannot remove a cataract, especially a confirmed one: I have tried the utmost of its use; and could do no more than to separate it, and break it into particles, by giving smart shocks through the ball of the eye. These particles would revolve in the eye into different attitudes, and gleams or sparks of light would occasionally dart through the floating particles; but they could not be diluted and dissipated: But, with a prudent use of the shocks, they may sometimes be helped a little, especially recent ones. I have made a good degree of betterment of one of eight years standing: but very few can receive any benefit from the shocks, after the disorder is more than one year old.

There is, undoubtedly, sometimes a degree of gutta serena accompanying a cataract; and perhaps those that may be relieved, are relieved by removing what partakes of the nature of gutta serena only. But it is, nevertheless, expedient to try the effects of a judicious treatment by the gentle electrifications, in all cases of cataract. There is no doubt but that an electrification will prevent their growing worse, and will remove any degree of opacity that depends on gutta serena, accompanying cataract.

But the greatest blessing accompanying electricity, in removing a cataract, is, in suppressing the inflammation that succeeds to the operation of couching or extracting of the cataract. This, however, I have not put to actual experiment: but, from its known effect in suppressing inflammation, under the application of several caustics upon a film, and of its suddenly removing any settled inflammation in the eyes, as well as in any other part, we cannot help knowing that it must be of inestimable utility in suppressing inflammation, which so often and so fatally succeeds to the operation of couching or of extracting a cataract from the eye.

Not only the success of the undertaking is suspended upon this anti-febrile specific; but also the principles of humanity dictate, that, as the ease and happiness of the patient are also suspended on the same means, they cannot be neglected with impunity. Who would suffer, for coffers of gold, what some have suffered, by inflammations that have succeeded to the couching of a cataract! This suffering may now be uniformly avoided, by any one who will be at a little trouble in the use of the gentle electrifications, and be careful to avoid that rock of destruction, cool air, on which so many shipwreck themselves, when under the use of electricity.

In the surgical operations upon the cataract, I shall recommend the treatment by electricity, to be made in the following manner, viz. Be-

fore the commencement of couching, let the patient be electrified two days: at least fifty shocks should be given each day; and as to their force, it must be adapted to the strength of the patient: If of a firm, robust body, let the shocks be strong. Pass some from the sides of the neck, and the rest from all parts of the head, to the feet. The shocks on the neck should be the strongest: they are easier sustained by the patient in that part than in the head. This previous electrification will make it necessary that the operation be made in a very warm room, otherwise the patient will take cold while the operation is performing, which would be very detrimental. The next day after couching, pass ten or fifteen shocks from the sides of the neck to the feet: On the second day, you may pass the gentle shocks from all parts of the head and face, as for inflammatory eyes, to the feet. Let this be continued a few days, as occasion may require, till all danger of inflammation is past. The covering of the head and face may be removed by slow degrees, after a few days; and astringents may be used, and the head and face washed with brandy: all which will enable the patient to bear the cool air the sooner.

*Fistula Lacrymalis.*

THIS must be treated much after the same manner as inflammatory eyes, with respect to the direction of the shocks; only it will

be proper to pass many of the shocks from the back part of the head to the part between the eye-brows, and all round the eyes: This is intended to remove the obstructions, and restore the quality and due secretion of the lachrymal. A few days electrifying is sufficient to remove this disorder, if the patient keeps sufficiently warm; but it will never cure, as I have experienced, if the patient repeats the colds upon it.

*Involuntary motion of the Eye-lids.*

THIS trifling affair, any one may remove, who doth not wish to retain it: The method will be, first, to cover warmly, and then pass twenty light shocks daily from just above the eye-brows to any part below the head: or it may be cured by extracting the electric spark from the eye-lids; but the gentle shocks are quicker in effecting the cure.

I have always been able to remedy this little inconvenience in about six or eight days, by giving fifteen or twenty light shocks each day, and keeping the head and face well secured from the cool air.

*Hæmorrhage.*

BROWN's elements of medicine contend, that emissions of blood proceed from debility; even the emission from the lungs, in a peripneumony, doth not take place previous to the inducement of indirect debility: and so he will have it altogether to proceed from debility, either

direct or indirect. I believe that emissions proceed from relaxation and extravasitation, in what is called flooding; and from extravasitation and redundancy in the head, from the nose, and in the chest, &c. without inflammation; and from inflammation and redundancy in fever and peripneumony. (Vide fever, chap. 3, page 97.)

By knowing the nature of any particular specific, and at the same time how the disease is affected by it, we may by those means be assisted in forming a judgment of the disease itself: And, after having minutely ascertained the effects produced by the electric shocks, I have been assisted in forming a judgment of the nature of some diseases more accurately than could have been done without the knowledge of electricity. Other specifics afford the same source of information. Thus it is well understood, in modern times, that opium is a tonic, and affects the animal functions, by inducing tone and tension; that it obtained the name of sedative in the days of ignorance; that it rouses the circulations, and strengthens the vessels to embrace their fluids in due degree of force. The restoration of this medium of tension and action, proves an ample specific or remedy of emissions, or of hemorrhage from the uterus, &c. Hence it is evident that the cause was relaxation; and, undoubtedly, that is accompanied by extravasitation. That it is attended, and promoted partly by extravasitation, is very



evident, from the consideration that the electric shocks do assist in restraining an excessive hemorrhage, of this description: this can only be done by the shocks, on the principle of an existing extravasitation. This extravasitation may as well be called redundancy, taking place through a laxity of the part whence the hemorrhage proceeds. It is counteracted by the tension of an opiate, by rallying the action of the whole vascular system, and so prevents the fluids from crowding too forcibly upon this lax portion of vessels, which vessels have, in a degree, lost the power of resistance, of propelling on, and of retention. The electric shocks impart a partial relief, by reducing the system to an equilibrium and tension. In so far as this equality of action is induced in the vessels, in the same proportion, or nearly so, will the flux be restrained.

From what hath been advanced, it is evident that both the shocks and opium may be used to advantage, in this kind of hemorrhage: And it is equally evident, that the shocks should be applied before the opium; not only because the shocks would, if given lastly, destroy the good effect of an opiate, as well as of any other tonic; but because the shocks, passing through the other parts of the vessels, avoiding the uterine, so as to reduce their action, and bring them as nigh as may be to a par of action with the parts of the uterine vessels, will, as I think, facilitate an agreeable action of an

opiate, and answer a very valuable indication of cure.

N. B. The shocks are recommended by British electricians. Emissions of blood from the head, in the chest, &c. without inflammation, or an increased action of the heart and arteries, is a circumstance dissimilar to the former case: This is undoubtedly a redundancy on the part whence the emission proceeds, formed on the principles of an extravasitation, or an inequality of the circulations. This is proveable, from the consideration of their being invariably cured by the electric shocks only, and that very suddenly too: but when the shocks first spring the vessels, the blood that is ready to be discharged spirts immediately out. But the blood being now attenuated, and every passage equally accessible, an easy circulation, and an equality of circulations, immediately succeed; and, consequently, there is no more pressure, no more local retention, and finally no more hemorrhage from the part.

In these cases, and on these principles, I have cured the bleeding from the nose, by passing smart shocks from the sides of the neck to the feet, and light ones from the forehead to the feet.

In the same manner I have invariably restrained bleeding in the chest, (I care not what part) by passing shocks through the chest, and every part of the system.

N. B. Cases of sudden strain, or wound by some accident, may require some other assisting means: but the shocks, in all cases, are a prerequisite, especially if the hemorrhage cannot be restrained without it. To make this familiar, I will relate an occurrence at Ballston pool.—A young man, riding down a hill in a waggon, was, by some accident, plunged from the fore part of the waggon to the ground, forward of the waggon, and two of the wheels ran over him, from his shoulder on the right, to his hip on the left side. Being nigh me, he was brought to my house, badly wounded, and hardly able to breathe, in great pain through his whole body. He was laid on a bed, nigh to the machine: I immediately passed fifty or sixty shocks through every part—gave him complete ease in his body, in every part but in his left hip; the bone of which being bruised, there remained a trifling pain. By some means his family doctor was soon there, and had orders to bleed him. I told him it would do no good; for the shocks had relieved him in every part, except the wound in the hip-bone; and the man declared he was easy in every part but his hip. But the doctor had orders to bleed, and wished to do it, if I had no objection. I assented. He let blood; it ran freely, but not forcibly. He unbound, and exclaimed, I am mistaken: I expected there would be difficulty in stopping the blood after taking the shocks; but it stops easier than usual. I replied, this

is one use of the shocks, to abate the force of the vessels.

I shall submit to the opinion of my reader to determine, whether it is, or is not expedient, in difficult cases of staunching blood, first to reduce the action of the arteries and vessels universally, and then to administer the usual stiptions.

The emission of blood in a peripneumony, and in the yellow fever, or that fever which has threatened the depopulation of New-York, Philadelphia, and some other of our sea ports, proceeds from a cause dissimilar to all the other cases.

With much deference to Dr. Brown's opinion, I am persuaded that the emissions of blood, in either of the above cases, do not wait the arrival of indirect debility; neither doth debility constitute any part of the cause. Just the contrary of all this is true: the increased action of the heart and arteries—their tremendous enginery, by which the blood is forced with violence upon the capillary vessels, and from which it cannot so readily recede—and they being by such a process greatly distended, they finally uncap, and emit their fluid: Rarification may also facilitate their freedom of emission; but rarification doth not form any essential part of the cause of this emitting blood, in these cases.

When indirect debility arrives, the whole system partakes in it, and it is likely to be

equal in the whole. It would abate the action of the arteries upon the capillaries, in proportion as it abated the power of resistance or of retention in the capillaries. Hence, the proper stiptic, in these cases, is that which takes off the tension of the arteries and vessels universally. This stiptic is now discovered: hence, we hail thee, adorable *ELECTRICITY!* late arrived, or lately known, the friend of human life—with celestial blessings furcharged, of late descended from on high, to bid the dying live, the sick revive, the pain'd to rest in ease, the blind to see, the lame be whole—to lead man on to lengthen'd age in ease—to be the sister blessing of that grace, destined in due time to fill all hearts, and reign triumphant through our disordered world.

The stiptic now appears to be electrical fire, by art administered in due form and just degree: this is the agent that will give softness and mildness in the action of the vessels, and consequently forever prevent the emission of blood in fever and peripneumony. The shocks ought to be used in the first stages of a fever, before any vessels uncap, as the fluid may be discharged into some cavity, whence it cannot be eradicated, and must mortify or putrify, and so prove fatal. Also, the patient can more easily support the action of such shocks as may be necessary to reduce the existing tensility of the vascular system.

*Hemorrhoids.*

HEMORRHOIDS, or the piles, will appear to be increased on the first electrifications: but this appearance is produced in the same manner in which it is produced in electrifying for cure of an ulcer, emission of blood, &c. It is peculiar to the shock, in the first instance, to promote any unnatural discharge, and which it will ultimately restrain. Give six or eight shocks daily through the part, until well; which, if you keep warm, will be but a short time.

*Ulcers and Abscesses.*

WHENEVER medical electricity shall be generally adopted in the practice, ulcers and abscesses will be rare as comets; but, for the present necessity, we must be something explicit. Whenever any tumefaction becomes purulent, it must be opened by the lancet, that the pus may be voided: after this is done, the shocks passed through the part, will immediately throw off and disperse the remaining morbid matter, reduce the tumefaction, and contact and heal the part.

All open sores, on the surface, will be clarified and healed, in the same manner, more surely and quicker than they can possibly be by any other means on earth.

Internal ulcers and abscesses, when once they are open and begin to discharge, are clarified



and healed, in the same manner as those on the surface; and, what is of no small importance, an abscess will never form a second time, no, not in any degree, after the first electrification: Pus may be formed, and, if that be the case, the shocks cannot give final relief, until the maturation is discharged; after which, it forbids, with omnipotent authority, a re-commencement of purulency.

In treating of this case, it may be useful to relate a particular instance of the effects of the shocks on an internal ulcer or abscess. Moses Lues, innkeeper in Galway, county of Saratoga, was, during my absence from the place, afflicted with abscesses in his left side: they formed and discharged, eleven or thirteen times, I have forgotten which, in the space of about two months; the greater part of which time, he was exercised with great pain, and became very inflammatory: he finally got through it for that time; but his health was very imperfect, and he was looking forward, with evident marks of despair, to the period when they would re-commence, and prove fatal. By this time I was returned to the place; and, being informed of his situation, I advised him to use the gentle shocks, as a preventative. He said that nothing had ever done him any good, neither did he expect any relief from any one. I importuned him in vain, till some time in the winter, about six months from his former sickness, the pain began again in the part of

the former abscesses: but he would not yield to me, till the pain and desperation obliged him to it. As I very much respected the gentleman, I was very glad of having an opportunity of preventing his suffering, if not of saving his life.

As the abscess was forming in his left side, nigh the diaphragm, I directed the shocks from the left, through the abscess, to the right side, about ten light shocks: the consequence was, soon after, that he coughed, and brought up a gill of coagulated blood, and the pain abated. Some hours after, I passed about the same number of shocks in the same direction as before: some time after, when he had retired to bed, he again coughed; we ran to the bed, and he brought up about half a pint of bloody matter, as before. This discharge was pleasing to me, and accepted as ominous of a speedy restoration; but Mrs. Lues was very much alarmed, fearing he would bleed to death. I observed, that it was much better to throw that matter off, before it increased to four times that quantity, became foetid and purulent, and induced a febrile state, as it had done before; that now the part affected, would be cleansed and healed, without any suffering to Mr. Lues. This all proved true: Mr. Lues had no more pain, no more discharge, excepting a trifle, that would sometimes discolour his spittle, when he coughed; but this appearance was but for two or three days. To be

brief, he was restored to soundness, and has remained well for several years since. *Query*—Is there any thing else on earth, that could thus have discharged that forming abscess, and clarified and healed the part with such facility and dispatch as the electric shocks?

My method of electrifying for ulcers, or abscesses, hath been, to pass the shocks through the part affected; and it is often useful to pass them through every part of the system: They must also be repeated daily, or once in two or three days, till soundness is restored in the part affected. I have mentioned the use of electricity only; but I do not mean that any assisting means ought to be neglected; unless for the proof of electricity, you may use it without conjoining any assisting means for a time, till your opinion concerning its use may be confirmed.

### *Rickets.*

ALMOST every page affords some evidence of the use of gentle electrification, to remedy or prevent the rickets in children, as it is chiefly in youth that this disorder prevails. All that hath been advanced of the various effects produced by the shock, in affecting the fluids and action of the vessels, serves to prove not only the absolute certainty of its salutary effects in this disorder, which so often proves the destruction of children, but argues the cruelty of omitting the only infallible remedy

of this disease. How physicians have overlooked electricity, in this case, I cannot conceive. Every prescription, indirectly, owns electricity its superior : they prescribe riding, the cold bath, various gesticulations, &c. to move the circulations ; but cannot, or will not ever think or speak a word of the electric shock : that must not be mentioned ; no, that is to be consigned to oblivion, or to sport away a leisure hour.

Whenever any unnatural ossification hath taken place, I know of no cure for that : but to prevent any increase thereof, and to remove a stagnation or a redundancy of cartilaginous matter, to attenuate the fluids generally, and open all the minutest circulations and secretions every where, and to establish a due degree of action, easy and in perfect conformity to the laws of animal life and health. To do all this, let the child be electrified (but gently) in every part, once in two days, about fifteen shocks at one time : let this be continued fifteen or twenty days, if need be ; and with the help of a careful nurse, to keep the child warm, it will receive all the benefit that man can give.

### *Locked Jaw or Joints.*

I ONCE offended a gentleman of the faculty, by saying the electric shocks were the most infallible remedy of this spasmodic affection. He said he knew all about it ; he had tried thoroughly, and it would not answer any good

purpose : but he thought it did more hurt than good ; it was more difficult to restore a locked jaw after being electrified, than before. This declaration was enough to silence any one, that knew no more about the business than he did : but I asked the doctor how many shocks he gave the patient ? he said about twenty. Perhaps you did not give them sufficiently strong. They were very strong. Did you cover him warmly about the head and face ? No, there was no need of it. Was the weather warm, or cold ? Cold. I replied, you have convinced me that you gave him no relief by such a treatment ; there was more danger of taking life, than of preserving it, by using electricity in a manner so inconsistently. However, this is but one error : the whole practice in electricity hath been rendered abortive, by errors on every hand.

In order to obtain relief, by the electric shocks, in locked jaw or joint, the mode of treatment must be conducted on principles entirely different to what is above related. The seat of spasm, whether it be the jaw or any other part, must be very warmly covered, previously to the giving of a single shock : the chains may then be applied to the patient in such a manner, as to conduct the shocks through the seat of the spasm. The intention of the shocks is, not to attenuate, not to dilate the vessels, not to induce any debility, but to promote the greatest frictional heat possible :

This must be done by the very gentle shocks, and in great numbers ; they must be continued, with but little intermission, until the spasm is removed. The wires should be moved, once in thirty or forty shocks, a little space, lest they blister the skin ; they need not be moved more than one inch at a time.

It is of use to electrify throughout the whole nervous system, in the same manner ; but the shocks may be a little stronger, and less in number than on the local affection. This universal friction, will have the effect to raise the local to a higher degree, and hasten the cure.

These operations must be alternated, and continued for hours, unless the spasm yields in a shorter time. A high and steady degree of warmth must be constantly observed, during the whole operation, till the cure is effected, and for days afterwards ; but lessened by degrees. These rules being observed, will never fail to restore a locked jaw or joint in a few hours, at longest. I have restored a locked joint in thirty minutes, by fifty gentle shocks.

These prescriptions and rules, carefully attended to, will extricate this most blessed of all the means of health and life, from the contempt which some people, who know little or nothing about it, are disposed to cast upon it.

In the instance above cited, of treating a locked jaw by electricity, there was every impropriety attending the process : the shocks were much too strong ; the part uncovered ;



the patient instantly took a cold on the part ; there was no friction promoted : All that was effected, was an increase of debility ; and to consummate all mischief, a deadly cold instantly struck the part. If any one will not believe that a cold will succeed so suddenly to the shock, they may be convinced of it, any time, in a cold day especially : Go into a cold room, with just covering enough to keep you from shivering ; there take eight or ten smart shocks ; then wait a few minutes, and see if the air, that before was tolerable, now feels like a cold bath : But you may buy your faith too dear.

Excepting it is determined to try the power of electricity only, it will facilitate the cure to conjoin all the assisting diffusible stimulants ; and it may be absolutely necessary, in extreme cases of difficulty, lest the patient be exposed to longer suffering than otherwise he might be necessitated to endure.

### *Bruises, &c.*

BRUISES, internal and external, are helped more and quicker, by the electric shocks, than they can be by bleeding, and all the other internal and external applications whatever : There is no mean yet discovered, that hath half the power of preventing coagulation, stagnation and concretion of the blood.

It is of inestimable value for internal bruises, and would undoubtedly save life in some such cases, when all other means would fail. When,

in some certain portion of vessel or vessels, the wound has nearly taken off all the action of the part, and when no other means could be able to prevent a concretion and mortification of the blood; yet in many such cases, the electric shocks, frequently repeated, would be likely to prove effectual. They must be frequently repeated, because the weakened vessel or vessels will be distended, by a retention of blood, through loss of tone and stagnation: the shocks being frequently repeated, will prevent this stagnation and redundancy in the part wounded; and opiates will assist in restoring the action of the weakened portion of vessels.

Moreover, the shocks will most effectually attenuate the concreted particles of blood, prepare them for re-assumption in the circulations, and prevent their sending off any ramifications to the neighbouring vessels, which might lay a foundation for some other morbid affection, in various parts of the system. There is proof sufficient of the power of the shocks, in separating, attenuating, propelling off, and diffusing from the part wounded, the coagulated, clotted particles of blood. This hath been noticed, (vide page 142.) When the wound or bruise hath not discoloured the surface, or when no coagulations have been visible on the surface, yet will it immediately appear, after a few shocks are passed through the part: It will be diffused through the muscle, from the part wounded, in the same direction in which the

shocks are passed. But these appearances are not always visible; it depends, as to its making any visibility on the surface, on the part bruised, and the quantity of coagulated blood in the part: But its appearing so suddenly after the shocks, when the situation and circumstances of the bruise will admit of its ever appearing on the surface, before it is absorbed in the circulations, proves that singular and very valuable effect produced by the shocks of this ethereal fire, on the fluids generally. This one effect of the shocks, being known, would justify the most serious and scrupulous enquiry into a thorough investigation of the subject of medical electricity.

Let me look up to the man of abilities, and ask what may be done, or rather what may not be done, by an agent, so excessively diffusible and fermentative? Is life and health of any importance to mankind? And, is not this medicine, (which, like Aaron's serpent, swallows up all the rest) of any importance? Say, ye whose ken penetrates the recesses of nature's laws, how far doth this ethereal fire exceed all the nostrums and celebrated specifics on earth? How doth it eclipse them, as the luminary of day eclipses the dimmest star? Will you have fevers to follow a judicious use of this ethereal fire? You will have fevers, then, without a checked perspiration, with an easy and voluntary flow of perspiration, with a due mixture of all the fluids, with a due and regular action

of all the secretions, without redundancy, without extravasitation, and finally, without stricture or tension, without any increased action of pulsation. Then tell me, ye whose business it is to speak evil of what you understand not, how will you work up a fever in the human body under these circumstances? You cannot, with all your dexterity, form a dropsy. How will you raise a tumefaction, or collect and retain a body of morbid humours in a part, so as to form an abscess, or an ulcer, before this fermentative agent? Neither can you, if you starve in consequence of it, any sooner constitute a peripneumony, or an inflammatory rheumatism, than you can a fever: This agent defies them all, and many more diseases. You cannot conceive of coagulation and obstruction, so as to hatch up a pleurisy in any form, before the electric shocks. Who, then, shall go about to obliterate this friend of human life, and dare to blot it out of view? Will you consign to death, unheard? Her advocates have faintly spoke from Europe;\* you listened not;

\* *From Europe, &c.* Dr. Welley, speaking of electricity, expostulates, saying, "I cannot but intreat all those who are well-wishers to mankind, to make full proof of this; certainly it comes the nearest to being an universal medicine, of any yet known in the world."—(Vide Primitive Physics.) And again, in his conclusion upon medical electricity, he says, "Before I conclude, I would beg (if it be not too great a favor) from the gentlemen of the faculty, and indeed from all who desire health and freedom from pain, that none of them would condemn they know not what; that they would

their voice was too weak to gain an audience. She wakes Columbia's child to plead her cause before the august tribunal of the human race. This advocate is friendly to the cause of truth, a true philanthropist; but, Moses-like, he is slow of speech: Sympathizing in man's ill, and fired with zeal to give him ease, his client's summons he obeys, harnessed with truth in every page; her picturesque he draws, in lines so fair and obvious to view, that none can mistake—" 'Tis errors absolute defeat." He calls on man, the jury universal, unempannelled—Say, shall merit so extensive, deeds benign, to miracle akin, be pronounced accursed? and, pregnant with blessings for you all, asks but your leave to give freedom from pain, to see long life, if life before be not destroyed, and quite a miracle required to restore it. Live it will, in future days, to bless the wise, who

hear the cause before they pass sentence; that they would not peremptorily proceed against electricity, while they know little or nothing about it," &c. &c.—(Vide Beauties of Wesley, page 154, 155.)

Again—Cavallo's Medical Electricity has a quotation to a treatise written by Dr. Lovet, entitled Subtile Medium proved; in which the Doctor says, "The shocks to be used in medical electricity, should be exceedingly light;" by which treatment, he hardly ever failed of curing, or at least, of relieving his patients.

It appears by Cavallo, that Dr. Lovet had used medical electricity for a long time, and had discovered its use in inflammation. N. B. Lovet used light shocks only; but strong ones are sometimes best.

know and prize her worth ; and all the question is, will you be blest to day ?

I know not how to address myself to mankind, that I may persuade them to their own good. I doubt not, but many will be convinced of the absolute benefit to be derived from electricity, who, notwithstanding, will need other arguments to persuade them, that "life is more than meat, and the body, than raiment." They are so engaged in lucrative pursuits, that all considerations of preserving life and health are postponed, till the fatal moment arrives in which both are lost.

But I have one or two more cases to treat of, before I close this chapter ; in speaking of which, I shall study brevity.

*Nerves contracted.*

RECENT contractions of nerves are generally very easily restored : but those of years standing, I have not been able to cure entirely ; sometimes they would be helped a little, and sometimes no good could be done them by electricity.

But contractions of a few months continuance, I have always been able to remove without any difficulty.

My method of electrifying, in such cases, has been to pass the shocks directly upon the nerves contracted, in their full length. I have given from twenty, to sixty and seventy a day ; and, the person being kept very warm, they



will generally relax quite fast. When, by some wound, a person is obliged to sit for a time in a contracted posture, and the nerves become fixed and rigid, &c. the shocks are of great use to straighten the nerves, and restore action in the nerves and tendons.

It is always the case, when bones have been broken, that the nerves and tendons have become inactive and torpid: but a few shocks, given lightly through the part, will restore action in one hour.

After bones have been broken, and put well to place, splintered and bandaged, the shocks passed through the part, will be of use to attenuate the fluids, to suppress swelling, to ferment the blood, and carry off the vitiated humours from the part. The wound will heal much sooner.

But in electrifying in such a case, if the patient hath not been used to taking of the shocks, and is afraid of them, let him (or her) take them lightly in a well part first, until they can take them without starting; then let the gentle shocks be passed upon the part intended; which must be done without much starting, lest the bones be thereby misplaced.

### *Sprain, or Strain.*

A VIOLENT extension of the nerves, tendons or muscles, in any part, is most commonly removed by the electric shocks. What is a little unaccountable, is, they will cure sprains, or

strains, that are of many years standing. A recent strain is sometimes relieved in one or two minutes, by eight or ten light shocks, given in the part wounded. Sometimes it is necessary to repeat the electrifications for several days. One thing is very certain ; that is, if light shocks will not help it, I have never found any thing else that could : but there are several applications or specifics, which, conjoined with the shocks, facilitate the cure. Keep warm.

*Felon, or Whitlow.*

AT its first appearance, having covered the part very warmly, pass twenty light shocks through the felon : it may be necessary to repeat it once. If this fails, throw into an earthen, or some other pot, some hot embers ; on these embers put a lock of sheep's wool, well filled with grease ; hold the hand on which the felon is, in this pot ; draw a thick cloth over the pot, round your hand or arm, to keep in the smoke and heat : this will greatly sweat your hand, especially after taking the shocks.

*Pains in different parts.*

PAINS in the back are frequently cured by passing the shocks from a little above the seat of the pain in the back, to the fore part of the thigh, so as to bring the shocks descendingly through the part lame. Sometimes I have

found it necessary to give the shocks pretty strongly; and sometimes strong shocks are prejudicial, and light ones only will give relief: hence, the first shocks, in this and all other cases, ought to be light, and increased in strength as occasion may require.

Pains or stitches in the side must receive light shocks through the part: if the pains shift from side to side, let the direction of the shocks be shifted as for pleurisy, (vide page 111.) Sometimes the most imperceptible shocks only will prove useful.

When these pains are caused, (as they frequently are in females) by suppression of menstruation, they must have the shocks passed in the direction recommended in that case, (vide page 182.) That direction will avail to the removal of the cause; and the other shocks in the side will give temporary relief, until the original cause is removed, and the foundation of general health is established.

### *Wounds, &c.*

IN whatever manner, or by whatever means, bones, nerves, tendons, or any part of the muscles are wounded, by strain, bruise, cut of edged tools, gun-shot, &c. the part so wounded is subject to irritation or inflammation, tumefaction, suppuration, &c. The propriety of using the electric shocks upon such wounds, will appear from the consideration of several

effects of the shocks, which have been already considered.

No one will doubt the propriety of reducing or of suppressing swelling, irritation, tumefaction, suppuration, &c. in such cases. Any one may know, that to purge the vitiated humours, and clarify the blood, is a ready way of healing a wound. If it is an open wound, it will be discharged, cleansed and healed with surprising dispatch. I think it would be of inestimable use in surgery, and that surgeons neglect their *summum bonum* in neglecting the use of the electric shocks, in many instances. Deep wounds in the flesh, by gun-shot and otherwise, would be greatly assisted by the shocks on the part: they will cause the wound to discharge freely; and, by suppressing irritation in all such cases, would facilitate a cure; and would frequently prevent a mortification by wounds.

But it is of importance to take notice of one circumstance that will attend the electrification of wounds which must be uncovered for dressing; which is, that a cold will be taken in the part, unless much care be had to prevent it. It hath been noticed, that, from the effects produced on the system by the shocks, there is no resistance to a cold; that the blood is so attenuated, and propelled to the surface every way, the pores so dilated and expanded, that unless the covering induces warmth equal, or nearly equal to the warmth of the blood,

the shocks do not produce the ultimatum of good effects, by reason of colds being thrown upon the blood: Hence, when a part is uncovered for dressing, it must be in air sufficiently warm, by a warm fire-side, by surrounding blankets well heated, pots or pans of coals, &c.

### *Drowning.*

I have never experienced the use of electricity in this case; I have only heard of its being applied for the relief of persons in this circumstance. Several years past, a physician told me of a surprising recovery to life, which was effected by electrifying the person; but I have forgotten the particulars.

It is, however, very certain, that the gentle shocks would go very far in inducing a recovery to action in the vessels, &c. The frictional action of the shocks upon the solids, their elastic action upon the vessels, would be the most likely to recover a person, of any thing, perhaps, in nature, that is yet discovered.

I will describe the method that I should pursue, or the manner in which I should apply the electrical shocks, on this occasion. After the person is taken out of the water, and laid on a bed, let woollen blankets be heated as much as possible, and wrapped round the body, next the skin; there should be two or three thicknesses at least: It will require three or four blankets, that one may be continually heating by the fire, to change with the others,

as they lose their warmth, that the body may be kept continually warm. This being done in as short a time as possible, without handling the body roughly by any means, commence the shocks without loss of time : let many be passed from hand to hand, through the breast, and from the neck or shoulders to the feet—perhaps three or four hundred shocks, with little or no intermission, unless signs of life should sooner appear : and likely it would be necessary to continue the shocks after symptoms of recovery ; yea, undoubtedly, in order to suppress spasm and convulsions ; for they sometimes are very terrible on this occasion. These shocks should be so strong, that a sound man may feel them jar his elbows, when taken from hand to hand. But if the person is of a slender weak habit, they must not be quite so strong. Some shocks should be passed from the head to the feet. These being continued a long time, and the body wrapped in hot woollen blankets, will induce action and life, if any thing but miracle can do it.

The shocks will move the blood, by springing the vessels ; and the heat on the surface, joined with the frictional effects of the shocks, will rarify and ferment the fluids, and would give strong hopes of success, after a person has lain hours under water. It is said, that, without these means being used, which are the most powerful by far, people who have lain six hours under water, have been recover-



ed to life ; and sometimes the means of recovery have been used two hours before any signs of life would appear. Surely, then, we need not despair of the restoration of one who has lain that time under water, when this agent, which is so well calculated to produce the desired effect, is made a discreet use of.

It is very proper for a strong person to blow his breath with all his might into the mouth of the patient, to distend the lungs ; then to depress them again by the hand. Let these operations be alternated and repeated from time to time.

Force nothing down the patient's throat ; but you may promote vomiting by tickling the throat with a feather.

Smoke of tobacco may be blown into the mouth, and spirits of hartshorn applied to the nose ; and snuff may promote sneezing.

When the patient can swallow, give a draught of warm water, with a table spoonful of mustard mixed therein.

The shocks supercede the necessity of bleeding, rubbing the body, &c.

Life subsides, sometimes, a long time before it becomes extinct. Wherefore, I would not utterly despair of success with these means, even when a person has lain twelve hours under water, especially a strong person.

Persons that have appeared to die suddenly, without disease, that have swooned or fainted, apparently into death, or have been hanged,

or in a fit of apoplexy, may many times be restored to life, by such a treatment ; also those who have been stunned and apparently killed by lightning, may be restored in a few hours, by these means.

But when the action of the shock of lightning hath ruptured or burst the vessels, it is undoubtedly too late for any means to restore life, except the resurrection power.

### *Suppressed Perspiration.*

WHEN the suppression of perspiration causes roughness and dryness upon the skin, perhaps some deficiency of the sebaceous glands, or vitiation of the sebaceous humour, producing disagreeable sensations upon the surface, such as itching, burning, smarting, &c. all of which may be remedied, by putting on warm covering, and electrifying one or two days.

### *Burns and Scalds.*

DOCTOR WESLEY says, that the most desperate burns, or scalds, are immediately relieved by passing a number of shocks through the part : I have found it to be a truth of no small consequence to mankind ; and was electricity of no other use, it appears, that its use to a man who has a large family of children, would justify him in being at cost the of a machine (especially a very cheap one, as I shall soon describe) for his own use, seeing such accidents are very frequent among children. The shocks

stop the smarting of the burn or scald immediately, throw off the fire and reduce the irritation, cleanse and heal the sore. Let the patient be warmly covered, and soundness will be immediately, or very soon, restored. To keep the part from chafing, dip linen rags in linseed oil, and apply to the part, or a poultice of roasted onions.

Having treated of so many cases, separately, the proper method of applying it in any case, may be easily inferred. Suppose for a cough, electrify through the breast : for a cold, generally, electrify throughout the whole system : for a stiff neck, through the neck, or rather down the neck. It is sometimes of as much importance as life itself ; I mean to women who sometimes take cold in time of child-bed : the shocks will go far, in restoring desperate cases of this description. The shocks must be lightly passed in every part, but especially through the uterus. Their debilitating effects must be counteracted by opiates, or something else, as soon as may be after the violent affections of the cold is removed.

I shall now make some general remarks, and conclude this chapter.

1. Let every person be warmly covered, before a single shock is administered.
2. Use the electric shocks as soon as may be after the disease is discovered.
3. In all acute diseases, call for the assistance of a skilful physician ; there will almost always

be some other medicine wanted to co-operate with electricity. In fever, there will be, most commonly, an absolute need of emetics or cathartics, of stimulants of one kind or another, of tonics, &c. of which the physician will be the best judge, who minutely observes the peculiar state and habit of his patient.

But the electric shocks are an infallible remedy of fever, abstractly considered ; and if used in the first stages, very little of other medicine will be necessary, in many cases and constitutions.

4. The shocks may be passed across the system, but should never be passed ascendingly, that is, from any part beneath, to a part nigher the head.

5. Strange appearances happen, after the first electrification, in some persons : some will smell of brimstone, who have not for a long time used or handled any of it ; their sweat, as well as their stools, will be scented as strongly as might be expected if they had taken large internal doses of sulphur.

6. The sweat of some people, when first electrified, will be glutinous, sticky like wax ; but this is peculiar to a state of dimness of sight, of gutta serena, and loss of sight by age : but this appearance subsides, as the shocks are continued, and a diaphoresis is kept up.

*Query*—Are not the shocks an excellent preservative of sight ?

7. People that I have electrified for suppression of urine, have frequently asked me, if electrifying did not induce an internal fever? They were very dry, they said: these symptoms would continue for two, three, or four days. These appearances I have imputed to a retention of the salts, of the microcosmic or marine salt, or both perhaps, through a deficiency of the urinary secretions: the whole mass of fluids imbibe an increased quantity; which, by the attenuation and fermentation of the shocks, are discharged from the glands in the mouth and stomach, into the stomach and intestines, and effect a sensation of dryness, in the same manner as drinking of sea-salt and water. The sweat, in this case, will partake of an increased degree of saltiness.

There is another appearance, in this situation, that is worthy of notice: there is always an increased degree of density of the solids, very perceptible in the vessels by laying your finger on the pulse.

This last appearance I have ascribed to the action of the marine salt upon the solids, in promoting this apparent density, in the same manner in which it is produced on the flesh of animals preserved in salt.

*Query*—Would not sea-salt prove an excellent stiptic? I say an excellent stiptic, inasmuch as it induces density without tensity—would harden the capillaries, without exciting the ar-

teries, by increasing the degree of their ten-  
sity, in a fever or peripneumony; and might  
prove very useful in that tremendous fever that  
pervades some of our sea-ports.





## CHAPTER IV.

**N**OTWITHSTANDING I have developed the whole subject of medical electricity, and made it familiar to the weakest capacity; not only discovered its inestimable use in preserving and restoring health and life—I had almost said its omnipotent power over diseases, especially the acute kind; detected the former absurd, inconsistent, pernicious manner of using this simple, powerful and blessed agent; fairly delineated and harmonised a system of practical rules, to be observed in treating by electricity in almost all diseases: yet if I drop the subject here, mankind are not likely to be much bettered by it. It is of small importance to be informed of a medicine that would cure, but cannot be obtained.

Kind reader, I am determined to withhold nothing that shall be necessary to consummate your happiness, and make you master of the whole art of medical and practical electricity. You shall reap the full harvest of all my labours, for nearly twenty years, on a subject that hath engrossed almost my whole attention, and with such unavoidable expences, as have prevented my being able to accumulate worldly pelf to myself.

During this time of practising medical electricity, I have discovered some improvements in the art of building the electrical machines,

both in respect to their convenience and cheapness.

A thorough knowledge of building the machinery, and keeping them in repair, is now what is wanting to consummate the whole business, and leave my reader master of the field. I know it would answer a more lucrative purpose, to reserve this part to myself: But, as it would impede what I ardently wish for, viz. that all mankind were in possession of the utmost knowledge and use of this precious mean of health, I freely forego any consideration of self-interest in the case, and participate the blessing communicated to mankind herein.

This chapter will contain, *instructions for building different constructions of machinery—of the insulating stool and bed—how to make a malgam—natural imitation of lightning—how to extract lightning from the cloud—the use of lightning-rods—cautions in time of lightning—how to use electricity as a preventative, &c.*

I shall begin by describing a machine, which may be built with about two dollars cost, and a little work; and will be more convenient for medical purposes, by far, than any imported from Europe, although they cost several guineas: but those of the European construction are built more for ornament than real usefulness; for the most of them cannot be charged in the summer season, when accute diseases are most prevalent, and the machines are constantly most wanted for use. But my constructions

will charge, more or less, any day in the year, by observing the instructions to be given for that purpose, in their proper place.

We will begin with the frame that is to support the wheel, and the glass that is to be turned by the wheel: they must both be placed in one frame, with the wheel directly under the whirl that is put upon one end of the glass, that a band may be passed round the wheel and over the whirl of the glass: in this situation, the wheel, being turned by a crank, will turn the glass also, by help of the band.

The frame will consist of two upright posts, about five or five and a half feet high, framed into two blocks or sills, about two feet and a half long: these may be five inches wide, and three deep, and framed together by two cross pieces; the distance of the sills must be determined by the distance of the two upright posts; and the distance of the upright posts must be determined by the length of the glass or cylinder, which is to be fitted to run between these upright timbers. This remark will apply in all cases of constructing the frame. But I mean, in this cheap construction, to use a common decanter for the cylinder, or globe, as it is called. We will suppose the decanter to be nine inches long, and we will suppose the woodwork, which must come upon the decanter, to occupy three inches more, which will make twelve inches; and two inches we will allow free, between the ends of the glass, &c. and

the upright posts and timbers: the whole distance then will be fourteen inches. This will answer for almost any decanter; because the wood-screws that are to be passed through these two posts, to support the cylinder or glass, may be varied a little, by passing one screw further through the wood than the other, &c. These upright pieces may be formed out of a plank, two inches thick and four inches wide. The screws that support the cylinder are to be inserted or passed through the upright posts, within six inches of the top, on a right horizontal line, pointing directly to each other; these points mark the centre of the glass: just below the glass, so as to clear the surface of the glass one or two inches, a piece of wood must be framed across into the side-pieces, to support them, and to rest the hand upon, when the cushion is applied to the cylinder in order to charge the machine. The wheel is to be hung with a shaft passed through its centre, so that its rim will fall below the cross-piece, just mentioned, about four inches. The two ends of the shaft may be supported on the sides of the upright posts, by cutting a half circle in the posts, and by cutting two half circles into two small clefts, and bringing them on over the other half circles cut into the posts: the two half circles making the whole circle of the shaft; they may be put on with nails or wood-screws. One end of the shaft must be left longer, and extended four inches clear of the outside of

the post, on that side on which you stand to turn the wheel, and a crank be put on this end to turn by, in the same manner as a grindstone is turned.

Now there is room, with this height of the posts, to make a wheel four feet in diameter. You may take your choice as to the circumference of the wheel; only this you may know, that the larger the wheel is, the easier will the machine charge: it ought not to be less than three feet diameter, to form a strongly-operating machine, for all seasons of the year.

The wheel may be made of boards, in a solid form, of half an inch thick each, and nailed, or put together with screws, the grain of one crossing the grain of the other, to prevent the wheel from warping, &c. and a place cut for the band: or the wheel may be formed by two arms, crossed at right angles, and halved together in the centre, leaving them sufficiently large to support the wheel on the shaft, and the rim formed of four felloes, brought on the ends of the arms, &c. and a place cut for the band. The wheel must be hung nigh the inside of one of the posts, directly under the whirl which is put upon the decanter, called a globe or cylinder.

In choosing a decanter to make a cylinder or globe of, observe that it is blown with a smooth surface, and round; best that the bilge be blown in an oval, or the form of an egg. The late-blown decanters are of a gradual contraction

of diameter, from the bottom to the top, or nearly so, and are not so convenient. Observe that the neck stands on a right line with the bilge; and, for the above construction of wood-works, the height of the decanter must be about nine inches.

To prepare the decanter for running—first, for the bottom, scribe a piece of wood, cherry, birch, maple, or mahogany, as you please, about one quarter of an inch larger than the bottom of the decanter; within that circle, scribe the circumference of the bottom of the glass, and sink the glass into that nearly half an inch; this is to be stuck to the glass by a cement. But, before that is done, a box of brass or iron must be had (a blacksmith can make them of iron) about an inch, or an inch and a half square, and a little more than a quarter of an inch thick, with the corners flatted down thin, and holes drilled or punched in them for screws to pass through into the wood: In the centre of this box a hole must be drilled or punched, to receive the points of the large screws, which are passed through the upright posts before described. This box must be sunk a little into the outside of that wood, prepared for the bottom of the glass; that wood being about an inch and a quarter thick, or an inch may be thick enough. These things being prepared for the bottom of the glass, then proceed to prepare the wood for the neck of the decanter. The length of this wood must be measured from the



part where the swell of the neck is about three inches in diameter, to one inch clear of the extremity of the neck of the decanter. The diameter of this wood at one end, viz. the end that embraces the swell of the glass, must be a little more than three inches; the other end may be two and a half inches: this may be turned in a lathe, nearly to the form of the glass, and it will make it lighter and better for use. But a hole is to be bored into this wood, from the largest end, to insert the neck of the decanter: it may be first bored with an auger, just large enough to receive the top of the decanter, and then with a large taper-bit, and worked out with a rasp, or other instrument, so as to sink the decanter, that the neck shall approach within an inch of the end of the wood. This wood should be turned, or worked off upon the outside, so as to render it thin and light, excepting the part where the whirl is to be turned in the wood; and the other box is to be sunk into the end, or else secured by screws without sinking, and is to be made in the same form of the former box, which is prepared for the bottom of the glass. The whirl may be turned, or the place for the band, within one inch of the end, and should be so turned as to pinch the band, otherwise it will render; but it must always be cross-banded. Having the boxes, screws, woods, all prepared, screw on the boxes, so that the sockets for the points of the large screws may strike the centre

of the glafs: Then prepare a cement to ftick the two woods faft to the glafs. You may ufe bees-wax, or rofin softened by a little tallow, or boil tar, without burning it, to fuch a confiftency, that, when cold, it will be brittle. Heat the glafs, as warm as can be held by hand, and likewife both the woods; let the cement be warmed till it is quite thin; daub fome of the cement all round the bottom of the glafs, kept warm by a fire; then pour fome hot cement into the place cut out, to fink the bottom of the decanter into; and immediately fettle the bottom of the decanter into its place, while the cement is all warm and yielding. This done, proceed in the fame manner to fecure the wood upon the neck of the decanter; and it is ready for ufe: Bring it into its place, between the points of the large fcrews, and fcrew up their points into the fockets; after which, put on a ftrong woollen band, and this part of the machine is completed.

It would be as cheap to purchafe a glafs blown purpofely for the bufinefs: but, becaufe they cannot always be had, I have defcribed this manner of preparing decanters; and they answer about as good a purpofe as any other.

*Prime Conductor.*—Whatever is made ufe of to convey the fire from the cylinder to the other glafs, called the receiver, may be called a prime conductor. I will now defcribe a cheap one. Turn a piece of wood (pine will do) three feet long, round and fmooth, the two ends a

little convex; cover it with tin, or, what is of less cost, with tea-led, drawn tight to all parts of the wood, and tacked on with small flat-headed nails; let it be nailed all on one side, in a straight line; it must be nailed, likewise, round the two ends; but the heads of the nails, and every part must lie smooth; there must be no points standing out, as they will throw off the fire, and you cannot raise a charge.

This conductor is to be hung under the chamber, or any other floor over head, on a horizontal line with the cylinder; or it may be raised higher, in order to hang the conductors: two staples, hooks, or brass rings, with screws, must be driven or screwed into the conductor, nigh each end, and on the same side. Into these staples, hooks, or brass rings, make the end of a large, long goose-quill fast, by turning the end of the quill round the ring, &c. and fastening the end back with a strong waxen twine. On the other end of each quill, make fast any small cord, of sufficient length and strength to support about twenty or thirty pounds weight. These quills are the best of any thing I could ever discover, to prevent the effluvia from passing off: It will pass off upon hair, upon silk, and, in damp air, it will pass off upon glass; but will never pass upon a clean goose-quill.

The next thing is, to drive another staple, hook or ring, into the under side of the conductor, nigh the centre: this is to hang a glass to, called the receiver, and will soon be descri-

bed. The next thing will be, to prepare a large wire, the bigness of a pipe-stem; one end of which is to be driven into the centre of one end of the prime conductor, and the other end, being first flattened with a hammer, and with a three-square file cut into three sharp points, is to approach within an eighth of an inch of the surface of the cylinder, in the centre of the glass: the points are to collect the fire from the glass, as it is promoted by turning the glass, and the cushion held to the glass at the same time. This wire conveys the fire to the prime conductor, and the prime conductor will convey it to the receiver, that is to hang under it. Observe, the wire, just mentioned, and the staple, &c. in the under side of the conductor, must both touch the lead, which is the coating of the conductor. The wire may be two or three feet long.

There is nothing more to be done to the conductor, than just to bore a hole on the upper side of it, as it hangs up, nigh the centre, in which to place the electrometer: This hath been described, (vide page 27—28) and need not be repeated.

*Receiver.*—The receiver, or battery-glass, is that which contains the shock. When it is charged, the inside is said to be plus-electrified, because it hath more than its natural quantity of elementary fire. The outside is said to be minus-electrified, because it hath less than its natural quantity; for the electrical effluvia is drawn off

from the outside of the receiver, and conveyed to the inside: by this the equilibrium of atmosphere is broken, and the effort is to restore that equilibrium: This is done by forming a conveyance from the inside, or plus-electrification, to the outside, or minus-electrification. When the human body forms any part, or the whole of this conveyance, it receives the shock, and the equilibrium is restored in the receiver.

That receiver which will be of the least cost, and will require the least preparation, and will answer as good a purpose as any other, will be a square case bottle; the larger it is, the stronger the operation. But in choosing the glass, be careful that there is not the least flaw or fracture in it: there will be sometimes almost imperceptible little fire-cracks in the glass, that emit the effluvia, although nothing else could possibly perspire through them. The glass must be sound, and free from all appearance of fractures. Fill the glass with brass filings, or with the cinders or scales from a blacksmith's anvil: let them be washed clean, then dried in a kettle suddenly over a hot fire, then sifted and put into the glass: cover the outside of the glass with the thinnest of tea-lead, such as comes in the green tea chests; let it come up as high as the straight sides of the bottle: fold four or five thicknesses of paper, and lay one such on each side of the glass, upon the lead; then, with a few yards of quality binding, bind all firmly and close to the glass, from top to bottom.

The next thing will be, to hang this glass under the conductor, in the staple before mentioned: This may be done by a large wire, like unto the former, a hook turned in the upper end, to hook to the conductor, and the other end passed into the glass, so as to touch the filling matter, let it be what it may. But how will you make the glass hang by this wire? There are two methods of doing this: one is, to drill holes through the wire; and another is, to turn a ring in the wire, which may be very small; then through the ring or the holes to pass a strong waxen twine, and make it fast round the neck of the bottle. This nearly completes the machinery. But two chains are wanting to convey the shocks to the patient: One of these chains brings the shock upon the patient, in any part where it is applied; and the other takes off the shocks, at whatever part it is applied.

These chains may be made of common wire, of the size of a knitting needle, cut eight inches long, and the ends turned and linked together. The chains should be six or eight feet long. One wire on each chain, at the end, must not be turned, but brought to a point, that it may run through the clothes of a person, or through bedding, if the patient is in bed; for the wires must always touch the skin. The other end of one chain must be made fast, or connect with the coating of the receiver; and this is the chain that passes the shock from the patient to



the vacuum or minus-electrification, and must never lie on the patient higher than the other chain, but generally lower. The other chain must have one end of it turned in a ring: this is to touch the prime conductor with, in order to take the spark, and bring on the shock upon the patient; and it will come upon the patient in that part where the other end of the same chain is applied. This must be well understood, or mistakes will be made in passing the shocks—their directions will be wrong, and that will do essential damage in many particulars. Notice then, once for all, that the same chain that takes the spark or shock from the prime conductor, brings the shock upon the patient at whatever part it touches the patient: For instance, we will suppose that one end of the chain, which takes the spark from the machine, is held in the patient's right hand; and one end of the other chain, viz. the chain that connects with the leaden coating on the receiver, is held in the patient's left hand. If the shock is passed, it will fly from right hand to left, in the straightest and nighest passage that can be found through the breast. The chain that brings on the shock, I have named plus-conveyance, because it conveys the plus-electrification, in the receiver, to the patient. The other I call evacuant, because it evacuates the plus-electrification, or shock, from the patient, at whatever part it is applied.

I hope, by this time, any one will fully understand how to direct the shock, according to the rules taught throughout the whole of chap. 3d. By means of two chains, and understanding their distinct offices, you will be able to observe all the rules prescribed for directing the shocks. You may pass the shock through the joint of a finger only, by laying the plus-conveyance on the one side, and the evacuant on the other; or place the plus-conveyance on the head or neck, and the evacuant on the feet, and the shock will fly from the head or neck to the feet.

The electrometer is an artificial measurement of the quantity of the charge, in any particular receiver; but the quantity or charge is greater or less, according to the bigness of the receiver; and the electrometer only exhibits to your view the degree of charge, in any individual receiver. The little cork-balls, in the electrometer, as the machine charges, condense round themselves, globular atmospheres; the atmospheres increase as the machine charges; and as the atmospheres increase, the balls are separated by their own atmospheres. When the machine charges freely, the balls may be propelled to a horizontal plain; and if there is no body intervening, to affect the natural attitude of their atmospheres, they cannot be altered by an increase of the charge from that horizontal position. If any body less electrified approaches the globules of the electrometer, it

will attract to it; but if higher electrified, it will be propelled by that body.

We have completed our machine for giving the shock, excepting a cushion, and the malgam to be put upon the cushion, in order to excite the friction upon the glass we call the globe, or cylinder. There are a variety of cushions made use of: some are fixed with a screw, or spring, under the glass. But I have never used any thing but a piece of soft calf skin, or deer or sheep skin; but the flesh side of calf skin, cut out of the flank, is the best of any that I could ever find; the malgam will adhere to it: the piece may be four or five inches long, and three broad; the malgam rubbed upon the flesh side. One end of this leather, held with the thumb in the palm of the hand, and pressed by the ends of the fingers to the glass, will collect the fire and charge the machine. It must be held to the glass directly opposite the points of the conductor.

*Malgam* is made of pewter and quicksilver, or zinc and quicksilver. Melt about one ounce and a half of pewter; when melted, pour it into a heated earthen cup or vessel; while it is in the melted state, pour into it one ounce of quicksilver; and when this is cool it is fit for use. A piece as big as a small pea, is sufficient to rub on the cushion at one time. A small piece of tallow, not to exceed a small pea, may be rubbed on the cylinder, in damp, sultry weather; and it will cause the malgam to ad-

here to the cushion. Sometimes it will charge best with the malgam side to the glass; and at other times, the leather without malgam is best: this is soon known, by turning the cushion end for end, or upside down. From these causes, I have never had my cushion immovably fixed to the glass, but have held it by hand. But it will be necessary to have the cushions supported to the glass by springs, in those machines which are carried by water-works; and the cushion must be of several yards in length, and, by means of some wheels and pullies, to have it draw slowly through upon the spring; perhaps four yards would be sufficient to rarify during twelve hours. The machine already described is the cheapest that can be built to answer medical purposes. But this construction may be rendered ornamental. The prime conductor, instead of being covered with lead, may be gilt with gold, silver, or brass leaf: the outside of the receiver may be gilt; and, if it were an open glass, the inside might be gilded. The wood-works may all be made of mahogany, and elegantly wrought; or of pine, and beautifully painted, &c.

There is another method of constructing the frame, which, on some accounts, will be more convenient, and the cost very little, if any more than the other; and it will hang the conductor, receiver and all in the same frame. This will make it more handy to move from place to place, to a bed-side or to the fire-side, as will

be necessary in damp weather, to dry the glasses; and to carry to a neighbour's house, if necessary, &c.

To do this, let the feet or fills, before mentioned, be cut four, or four and a half feet long, and the two posts that support the wheel, &c. be framed quite to one end; and let two pair more be made, of an inch board, and three or four inches wide; one pair must be framed in quite to the opposite end of the same fills; then observe the distance of the two staples or rings in the conductor, by which it is hung, and make that distance the distance of the two last posts, or upright strips of boards; then let these two additional posts be crossed at the top with strips of boards; then to these cross-pieces hang the conductor. These last posts may be again crossed by two other pieces, as low as the bottom of the receiver, and a board, laid upon these cross-pieces, will serve to rest the receiver upon: this will be more safe than to suspend so great a weight upon the conductor. The electrometer may still be stepped in the centre of the prime conductor, on the top, as before directed.

The top of the receiver, or the uncoated part of the glass, must always be kept very clean and entirely dry: in damp weather, it must be rubbed dry with cloths, or be dried by a fire: a hand that is sweaty or greasy, must not touch that part of the glass, neither must a person breathe upon it; that dampness upon the glass

would form a conveyance from the inside to the outside of the glass, and the machine could not charge—the equilibrium of atmosphere could not be broken. In bad states of air, it is detrimental for people to stand round the receiver, or for many to be in the same room: their breath creates a dampness, that impedes the charging of the machine. If the wind is not very dry, it has the same effect.

The receiver may be charged, and the shocks given, (though not accurately) without all this parade of a large conductor, &c. Thus, take the large wire, that extended from the prime conductor to the cylinder, and, having a cork that will fit the bottles, run the wire through the cork, so as to touch the substance with which the glass is filled; then, holding the receiver in your hands, bring the pointed end to the cylinder, as high as before directed; and the cylinder, being turned, will charge the receiver as highly as by any other means: But you cannot know the degree of the charge, and it would be dangerous to electrify weak persons in this manner. In dry weather, this receiver may be carried a great distance, and the shock given from it: In this case, a person may take the shock by laying one hand on the coating of the receiver, and touching the other to the wire that goes into the receiver: his body will form the whole conveyance, from the plus to the minus electrification; or he may use both chains, as in the other form of charging.



N. B. A machine should be kept in a dry room, where there is a fire, that it may always be ready for use. When a malgam cannot handily be had, chalk may be scraped on the cushion, and that will charge the machine.

*Insulating Stools.*—Take a board, sufficiently wide and long for a person to sit upon in a chair; and across the ends of this board must be nailed two other pieces of board, as long as the other is wide; and the width of these must be sufficient to let through the bottom of porter or wine bottles; one bottle through each end will stand under each corner of the wide board, which will form the stool, or stand, upon four glass legs, at each corner: these bottles must be set in with a strong cement, like that used upon the cylinder; when this is done, the stool will rest upon the necks of the bottles, to the floor: these bottles should be of an equal height, and must always be kept clean and dry. The wood must be rounded on the edges and corners; no sharp points, splinters, heads or points of nails, must be suffered to stand out of the wood; the surface must be smooth in all parts; any roughness, points, &c. will dissipate the fire, or effluvia, and so prevent the insulation, at least in a degree.

A person, standing or sitting on this stand, may communicate with the prime conductor, by laying on a hand, or else by holding a large wire by one end, and resting the other on the conductor. The ends of this wire should be

covered with bees-wax; or, if the wire is large, and rounded smoothly, it may do well enough. The person in this situation, and the machine being charged, will be on an equilibrium of atmosphere with the prime conductor. If the person is touched by the finger of a spectator, a spark of fire will be very visible, in a dark room.

Many entertaining exhibitions may be performed on the stand, and by many other parts and powers of the electrical bodies, in different parts of the machinery; such as wheels running—balls swinging—figures of the human species, cut out of gilt paper, dancing—imitation of snow or rain, storms, &c. and many other strange appearances, too numerous to mention: and, as real usefulness, and not amusement, is the object of these pages, I shall pass the most of them unnoticed.

The use of these glass legs are, to prevent the effluvia from passing off to the floor: accordingly, holes may be bored in the bottom of the bed-posts, and the necks of the bottles inserted, one in each post, so as to cut off communication with the floor; and a person may be insulated in bed, by means of a metallic rod, to communicate with the prime conductor.

I have described the aural tube, or rod, (vide page 191—192.)

*Natural imitation of Lightning.*

DRILL a hole through a quart decanter, as large as will receive a small wire; put into the decanter a little of the white of an egg, just enough to daub over the bottom of the decanter; for you cannot turn any back without its falling upon the sides of the glass, and that must be avoided: then throw in of the filings of brass, or fine cinders, prepared as before directed, as many as will cover the bottom of the decanter; then let it stand till it is quite dry; then shake out the loose particles; then put a wire into the bottom, and, by a stick put into the decanter, turn the end of the wire short down, to prevent its drawing out; then cut gold or silver leaf into very small particles, so many as will fill a table spoon; put them into the decanter; let a large wire be passed through a cork that will stop the decanter, and a leaden, pewter or brass ball, as large as will enter the decanter, must be put upon the end of the wire, and put into the decanter, and let down within four or five inches of the bottom: the wire must be made fast at the neck of the decanter, by the same means that were directed for the receiver, (vide p. 250:) A hook must also be turned in the end of the wire, that it may be hung under the conductor, which will require another ring, or staple, (for the receiver must not be taken off.) When all this is ready, let the chain that I call the

evacuant, be connected with the wire that is in the bottom of the decanter: then there is a metallic conveyance formed from the plus to the minus electrification, on the receiver, excepting four or five inches, which is the distance between the bottom of the decanter and the ball that hangs in it. The intention now is, to make the whole charge leap from the ball to the bottom of the decanter; and I suppose the fire may be made to leap much farther, but I have never tried it.

The particles of gold leaf, I have substituted for particles of rain, falling from the thunder-cloud, &c. As soon as the machine charges; an atmosphere will be formed round the ball in the glass: this atmosphere will attract the particles of leaf, and they will strike the ball; by which means, each particle receives an atmosphere of its own, and is instantly repelled by the superior atmosphere of the ball, and strikes the bottom of the decanter, where it loses its atmosphere on the metallic substance, prepared for the purpose; hence it is instantly subjected to the laws of attraction, and strikes the ball again, &c. Thus these thousands of particles fly, in quick succession, from the plus to the minus electrification, until they chance to come in such close contact that they form a conveyance, and the whole charge leaps or breaks down upon them to the bottom of the decanter, and is by the wires conveyed into the vacuum, or outside of the receiver. In

good weather, with a large receiver, there will be a striking imitation of the fire from the cloud; there is the same divergency and zig-zag appearances: it is lightning, to a demonstration; but, in order to render it conspicuous, it should be performed in the dark.

It is the ascending particles which form the conveyance chiefly, because the descending are propelled from each other by their atmospheres; many of them will fall on the sides of the glass, forming partial conveyances; this will often cause the spark to shoot round about in the glass, in the same natural manner in which it is seen in the cloud, when it hath not a sufficient conductor to bring it to the ground. The ball in the decanter answers to the state of the thunder-cloud; the bottom is the state of the earth, and the particles of leaf are a substitute for the falling rain, &c.

*Method of extracting Lightning, &c.*

LEST some should suppose, that the shocks from the artificial machine are not, in their nature and effect, the same as those which descend from the clouds, I will state the method of putting it to actual experiment, as it hath often been done; and if it proves true that the action of lightning from a cloud is the same, in nature and effect, on the human body, then no uncertainty remains of the truth of my leading principles, on the subject of medical electricity.

Make a small cross, of two thin, light strips of wood ; the arms must be just long enough to reach the four corners of a large thin silk handkerchief, when extended ; tie the four corners of the handkerchief to the extremities of the arms of the cross, and this forms the body of a kite ; to this add the loop, tail and string, and it will rise in the air, as freely as one made of paper : But this will bear the wind and wet, in a storm, much better than paper. To the top of the cross, set in a sharp-pointed wire, rising about eighteen inches above it : tie in a large key to the end of the twine that holds the kite ; and to the other end of the key make fast the small end of a goose-quill, and by the other end of the quill the kite is to be held. This quill will prevent the fire from running below the key, if the quill is kept dry ; and in order for this, the person that holds the kite must stand in a porch, or under some other covering, that the quill may not be wet. Neither must the twine, or string by which the kite is held, touch any part of a building, tree, or any thing else. As soon as the thunder-cloud comes over the kite, the pointed wire draws the electric fire from the atmosphere of the cloud : this atmosphere of the cloud is attracted towards the earth, because the earth is less electrified than the cloud. The atmosphere of the cloud points or tails toward the minus-electrification in the earth, in the same manner



as the superior atmosphere, or plus-electrification in the sun, propels the atmosphere of a comet into a tail or stream of extreme density, behind the comet, opposite the sun; whereby its density, not rarefaction, (as Sir Isaac Newton supposes, because it is secluded from the sun's light) appears luminous, very much like the aurora-borealis, which we know is not rarefaction.

By the atmosphere of the cloud's being attracted towards the earth, the kite is soon enveloped in higher electrification, and conducts it towards the earth. As soon as the twine becomes wet, so as to conduct the fire more freely, it will stream from the key, on the approach of a finger.

N. B. It is well to wet the twine before the kite is sent up.

If you hold a receiver to the key, prepared as directed, (vide page 251 and 252) it will be charged in the same manner, and produce the same kind of a shock, as it would if held to the cylinder, and the fire collected by the artificial machinery; and if you stand upon an insulating stool, and hold one hand on the key, you will be filled with fire, in the same manner as you would be by holding a hand on the prime conductor of an artificial machine.

Every effect produced, and every appearance, proves that the fire extracted from the thunder-cloud is the same in its properties and effects as that which is promoted and collected

by the artificial machinery. It consequently establishes the truth of my hypothesis, drawn from the over-action of the shock received from the thunder-cloud, concerning which it was contended, that if the excessive, or over-action of the electrical effluvia would so swell, dilate, distend or expand the vessels, as to take off all tone, tension or action on the whole vascular system at a touch, thereby causing an instantaneous cessation of pulsation, and not only so, but also to rupture or burst the vessels, that a due degree might be found, and indeed is found, that will take off that over-action arising from an increased degree of tension, or diminution of the diameters of the vessels, which attends or constitutes fever, peripneumony, and all the like cases of increased morbid action. Also, as the over-action of the shock was conspicuous in dilating and expanding the pores in the skin, (vide chap. 2d, page 72 and 73;) where it is clearly demonstrated, that in the artificial and proper use of this element, we have found an infallible cure of fever and inflammation; and by its expanding the vessels, fermenting and attenuating the fluids universally, it promotes every description of secretions, clears every obstructed vessel, separates every coagulated particle, induceth an easy, uninterrupted equilibrium of circulations; and, considering the direct stimulus of the supernatural insolation, its power of invigorating the circulations, and animating all the

animal functions, being the criterion of life itself in the state of nature, we may with the utmost propriety conclude, even without an experiment, that nine-tenths of all necessary medicine is comprised in a judicious and prudent use of this ethereal fire; especially if we consider its power of preventing some particular disasters, which, when arrived and seated, it cannot remove, such as the stone, universal palsy, and a few other diseases, in some of which it can do no good, and but little in some others, but which may almost, if not always, be prevented by a prudent, frequent and timely use of the electrical effluvia.

But if, after all the arguments made use of in the subsequent pages, a doubt should remain of the truth of my pretensions, let the experiment be made, without any variations from the prescribed rules, carefully avoiding coolness and the over-action of the shock, and all doubting will soon vanish, and leave me master of the field of contest, with thousands who have ignorantly and wickedly opposed the progress of an art, in the completion of which the lives and healths of mankind are deeply concerned.

### *The use of Lightning-Rods.*

THESE rods, invented by Dr. Franklin, are a great safety, not only to buildings, to prevent them from being set on fire, or blown and shivered to pieces; but, what is of greater

importance, they are a safety to the lives of people, in a building where the rod is properly placed. This safety doth not consist only in the points attracting the effluvia that approaches nigh to the house unto the rod ; but also in the quality of the rod to conduct this expanded element clear of the building, being the most suitable and apt conductor known, and from which it cannot be easily diverted by any other bodies, although in the closest contact with it, especially such as generally compose buildings : and, if a human body was in contact even with the rod, it could not divert a sufficient quantity from the rod into itself to take away life, unless the body of fire was considerably large, (vide chap. 2d, page 70 and 71.) A person may extend his hands upon a wire, and a strong shock may be passed upon the wire, through his hands, and there will not be the least perceptible degree diverted from the wire into that body. But, inasmuch as the human body is an apt conductor, though inferior to metallic substances, a shock may be raised so high that a part, in this circumstance, would be taken into the human body from the wire.

A building that is lengthy, should have a rod at each end of the house ; or if there is but one funnel carried out, and that nearly in the centre of the house, the rod should be extended eighteen or twenty feet, at least, above the chimney, that the attraction of the points

may be the sooner felt by the approaching lightning; lest, by some oblique direction of the body of fire, it should escape the points and fall upon the house.

But a better method to secure a large building, would be to raise one rod in the centre, as before described, and to weld on two arms a little above the ridge, extending their points to the two extremes of the building: such a position of the points would undoubtedly catch the falling lightning, in whatever direction it might approach a building. The lower end of the rod should be sunk six or eight feet into the earth, and a bushel or two of charcoal placed round the bottom of the rod; the coal will separate the body of fire into thousands of small particles, by which means it will be the more readily absorbed in the earth, and prevent its ploughing up the ground.

*Cautions in time of Lightning.*

As it is undoubtedly true that lightning, or the electric shock, inclines to some conductors, in preference to others which are less apt or suitable; and as the human body is a more apt or suitable conductor of this effluvia, than the materials which commonly compose a building, whether they be wood, brick, stone, &c. it is not difficult to infer the danger that the human body is exposed to, by touching the sides of a building, at the instant a body of lightning falls upon it. The instant the elec-

tric body touches a building, that whole building is plus-electrified, and the body of fire instantaneously feels its best passage through the building. An electrician might easily account for all its windings and various directions through the house; and it will make use of every the least preferable conductor that is in contact with any perpendicular part of the building, although they may be sometimes in a horizontal position. From these principles it is, that people are always slain who are found in contact with the upright parts of a building, destitute of rods, when struck by lightning; while others, in the same building, will often escape unhurt. It is not often known, that people in the middle of a large room are slain by the shock, although they may be stunned: and when it so happens that they are slain in such a part of the building, it is commonly in consequence of the shock being conducted by some apt conveyance, and discharged from its extremity into a direction with the person in the room: such may be fire-arms, swords, &c. The lock of a musket would undoubtedly discharge it upon the head of a person sitting or standing under it. Such metallic instruments ought to be kept out of a dwelling-room, or hung perpendicularly down the sides of a room, with the lower extremities nigh the floor. It is more safe to sit low in a room, than to let the head approach nigh the flooring over head, lest the head attract



the shock from the materials above, to itself, being a better conductor. In choosing the safest place in a room, let the greatest distance from any of the sides, be that of a fire-place, especially if there is a body of smoke ascending : The smoke, as I have experienced, will conduct the effluvia ; hence the lightning most commonly comes down the chimney : wherefore take the greatest distance from a fire-place. When there is lightning in the night, draw your bed two or three feet from the sides of the room, lest the fire strike off the side into the bed, and kill you.

People in the fields are apt to take shelter under a tree, in time of a thunder-shower ; but this is highly imprudent ; and sometimes mowers will hang their scythes over their heads, on the same tree. In this circumstance, people have been found dead, lying in a direction with the points of their scythes, from which the shock was emitted into their heads. Perhaps they might have escaped, had they placed themselves in a contrary position with their scythes. Moreover there is danger from the splinters, if the lightning is conducted deeply into the tree, which is often the case, especially in pines : the sap of a pine is a non-conductor ; and hence pine trees more frequently receive the lightning into their hearts, and consequently are blown asunder from top to bottom.

From all these observations, it appears to be every one's duty to keep at a distance from trees in time of lightning, and use all prudent means, since we now know the nature of this element, to escape dangers by it ; which is as much our duty, as to provide against wind, rain, or danger from any other disastrous contingency in nature ; neither can it imply any distrust of Divine Providence.

*Some further Directions for using Electricity.*

As electrifying, in a proper manner, is not only a restorative of health when it is lost, in an extraordinary degree ; but also an extensive preventative of diseases in general, (even when they become epidemic and very mortal, under particular circumstances) in those who use it in a manner favourable to its true principles ; or if disease should appear in a person who hath been under a prudent use of electricity as a preventative of disease, which I have never known to happen, it must be mild, and easily flung off. As to fever, it is impossible, in the nature of things, that it should commence in any person that shall use this truly anti-febrile specific in manner and degree which is now to be prescribed.

In pointing out the proper manner of using the electrical shocks, as a preventative of disease, fever in particular, my attention will be principally turned towards those suffering people in the metropolis of several of our sea-ports

in the United States, and may be equally serviceable to any others in the like circumstances; and not only so, but may afford sufficient information on the mode of treatment in dissimilar circumstances, varying according to the nature of the prevailing disease.

The fever which hath, for some years past, threatened to depopulate New-York, Philadelphia, &c. and may possibly attack them again, in its progress hurries on to sudden death. It may not always be safe, even with electricity at hand, to suffer an attack of the fever, in some habits, without, at least, preparing the system to receive it mildly: In order for which, I will prescribe the best methods in my power. Let persons of a firm, robust habit, electrify once in a day, especially if the disease is very prevalent; the number of shocks must be discretionary, observing to take so many as will be sufficient to promote perspiration freely, with a trifle of exercise. Sometimes it will be sufficient to electrify once in two or three days, as people are differently affected by the shocks; but so many of the shocks must be taken as will keep the fluids sufficiently attenuated, the secretions in free action, the perspiration voluntary and easy. These operations being made in the system, it will be impossible for any morbid, increased action to arise in the system: the causes of morbid heat are intirely cut off; and it is impossible, in the nature of things, for fever to arise. And, even if fever has, in any degree,

its rise from the crasamentum of the blood, as some suppose, electrifying will reduce the crasamentum, as I have often observed when I have used it frequently on the same person, especially if perspiration is kept up. If any will drink ardent spirits, it will be necessary for such to use the shock more frequently than those who make little or no use of them. The number of shocks necessary for a robust person to take daily, may be from six to twelve; some of which, being the last on each time of electrifying, should be passed from the sides of the neck to the feet. Foulness of the stomach, and costiveness, must be carefully avoided by their proper remedies. If, by any means, as by sudden cold, symptoms of fever should appear, then the whole process by electricity, as directed for fever, must be immediately resorted to: the whole safety by electricity, is suspended on the immediate application of it to the patient.

People of delicate habits will be equally secured against fever by an application reduced to the degree of their diminished strength: they may observe the same decorum; that is, to electrify just so much, and so frequently as will subject them to an easy, voluntary perspiration, but not profuse.

The only thing to be regretted in the use of the electric shock, is, that the subject of it is necessarily subjected to a strict attention to a steady degree of warmth: this must be attended to, or a sudden cold will, in all probability,

induce that same disease which you are endeavouring to avoid. People who labour, should provide themselves with warm clothing, to be put on as soon as they desist labour; and watch all opportunities of danger from every quarter.



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